Z1Z Resorts Pty Ltd
Ningaloo Lighthouse Resort Project
Lot 2 and Lot 557 Yardie Creek Road, North West Cape

EPBC 2020/8693

# Construction Environmental Management Plan (Rev 2)

7 February 2023

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JBS&G Australia Pty Ltd T/A Strategen-JBS&G

## Document History

| Revision # | Date | Description |
|---|---|---|
| 0 | 29 July 2022 | Draft for EPA/DCCEEW Review |
| 1 | 30 November 2022 | Revised to include DCCEEW feedback (August 22) |
| 2 | 7 February 2023 | Revised to include DCCEEW feedback (January 2023) |

## Declaration of Accuracy

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed _____

Full name (please print) _____

Organisation (please print) _____

Date _____/_____/_____

***To be signed following review by EPA and DCCEEW***

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# 1. Introduction

## 1.1 Background

Z1Z Resorts Pty Ltd (Z1Z Resorts) is proposing to redevelop the former Ningaloo Lighthouse Caravan Park on Lot 2 and Lot 557 Yardie Creek Road, North West Cape. The proposed redevelopment, the Ningaloo Lighthouse Resort Project (the Proposal), is located approximately 18 km northwest of the town of Exmouth towards the northern tip of the Cape Range peninsula (Figure 1).

The anticipated maximum life of the proposed development is 55 years. It is anticipated that removal of all surface and buried infrastructure, except for heritage listed buildings, will occur within 2 years of cessation of operations.

The Proposal has been referred to the Department of Agriculture, Water and the Environment (now the Department of Climate Change, Energy, the Environment and Water) and has been determined to be a Controlled Action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2020/8693) with the assessment approach being assessment by an accredited assessment process under the Western Australia *Environmental Protection Act 1986* (EP Act).

The environmental impact assessment documentation is available via the WA Environmental Protection Authority (EPA) website (https://www.epa.wa.gov.au/proposals/ningaloo-lighthouse-resort-project).

## 1.2 Proposed Action

The proposed action under the EPBC Act is:

> *To develop the Ningaloo Lighthouse Resort on Lots 2 and 557 Yardie Creek Road, near Exmouth, Western Australia* [EPBC Act referral 2020/8693 as varied by variation request dated 3 June 2021].

## 1.3 Proposal Content

The Proposal, for the purpose of the EP Act assessment, is described in Table 1-1 and the extent of the Proposal for both the EP Act and EPBC Act assessments is defined in Table 1-2.

**Table 1-1: General Proposal Content Description**

| | |
|---|---|
| **Proposal title** | Ningaloo Lighthouse Resort Project, Yardie Creek Road, North West Cape |
| **Proponent name** | Z1Z Resorts Pty Ltd |
| **Short description** | Proposed redevelopment of the Ningaloo Lighthouse Holiday Park, within Lot 2 and Lot 557 Yardie Creek Road, North West Cape, and includes associated infrastructure (including the borefield).<br><br>The Proposal comprises the construction of new visitor accommodation; the construction of associated ancillary facilities (i.e., staff accommodation, power supply infrastructure, water supply and treatment, wastewater treatment and reuse, and replacement service station (vehicle refuelling) etc.); refurbishment of the Vlamingh Head Lighthouse Quarters (a part of State Heritage Place ID: 00837); and minor works outside of the accommodation areas, including pathways, vehicle access, shades structures and service corridors and enclosures.<br><br>The proposal is located on land used for tourism accommodation (caravan park and resort) for over 30 years (Figure 1). |

**Table 1-2: Proposal Content Elements**

| Proposal element | Location / description | Maximum extent, capacity, or range |
|---|---|---|
| **Physical elements** | | |
| Resort and caravan park facilities and associated service infrastructure | Figure 1 | Clearing of up to 3.98 ha of native vegetation within a 45.34 ha development envelope, with a total disturbance footprint, including the existing facility, of up to approximately 13.63 ha. |
| Operational elements | | |
| Treated wastewater irrigation | Figure 1 | Irrigation of up to 40,000 kL/year of treated wastewater to landscaped areas (open space, gardens) within the resort footprint. |
| Groundwater Abstraction | Figure 2 | Groundwater abstraction of up to 72 ML/year. |
| **Rehabilitation** | | |
| Following completion of construction of resort buildings and infrastructure, cleared land within the footprint will be landscaped and revegetated. | | |
| **Commissioning** | | |
| N/A | | |
| **Decommissioning** | | |
| Removal of all surface and buried infrastructure, except for heritage listed buildings, within 1 year of cessation of operations | | |
| **Other elements which affect extent of effects on the environment** | | |
| Proposal time | Maximum project life | 55 years |
| | Construction phase | Approximately 2 years |
| | Operations phase | 50 years |
| | Decommissioning phase | Approximately 2 years post operations |

## 1.4 Scope and Purpose

This Construction Environmental Management Plan (CEMP) describes the management measures to be undertaken to minimise, and where possible, eliminate any potential adverse impacts on key environmental factors during the construction phase of the Proposal. This includes the following activities, which will be undertaken during daylight hours only:

- Demolition of existing infrastructure;
- Clearing of native vegetation to facilitate construction;
- Construction of new visitor and staff accommodation;
- Construction of associated ancillary facilities, including:
  - power supply infrastructure;
  - water supply and treatment infrastructure;
  - wastewater treatment plant and irrigation infrastructure;
  - removal of underground fuel storage tanks and associated pipework; and
  - installation of containerised above ground multi-compartment fuel station and associated infrastructure;
- Refurbishment of the Vlamingh Head Lighthouse Quarters (a part of State Heritage Place ID: 00837);
- Minor works outside of the accommodation areas, including pathways, vehicle access, shade structures and service corridors and enclosures; and
- Landscaping of cleared and degraded areas utilising native grassland and shrub mixes and sparse trees to mimic the surrounding hummock grassland and dune vegetation found currently surrounding the site.

## 1.5 Out of Scope

Environmental management and monitoring required under the following management plans are out of scope for this CEMP:

- Inland Water Quality Management Plan (IWQMP);
- Turtle Management Plan (TMP); and
- Artificial Lighting Management Plan (ALMP).

Monitoring required to be undertaken to meet the requirements of these plans during the construction phase of the project will be coordinated by the Project Manager.

Environmental management measures associated with impacts resulting from the resort operation and future decommissioning activities are out of scope for this CEMP.

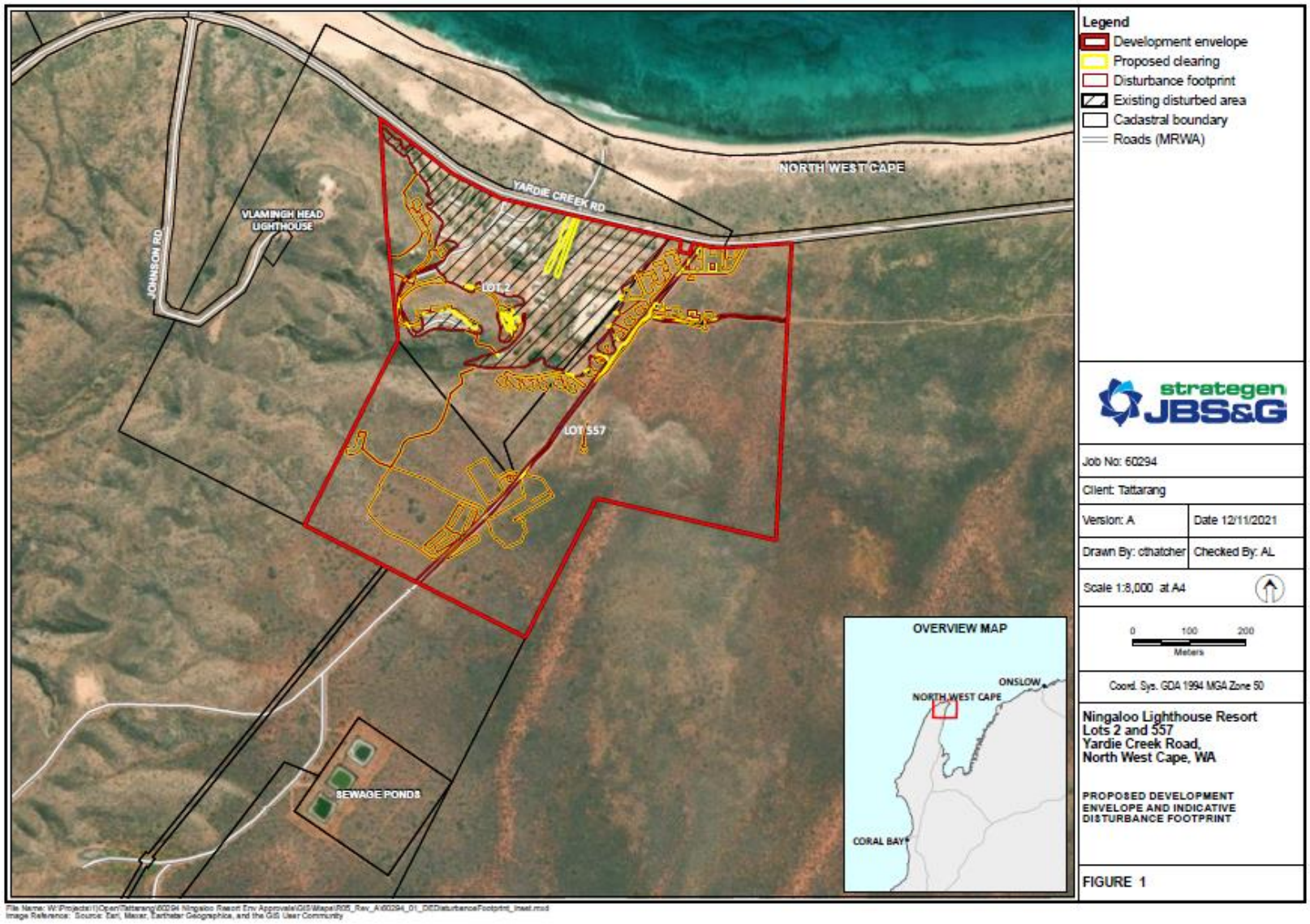


**Figure 1: Proposed Development Envelope and Indicative Disturbance Footprint**

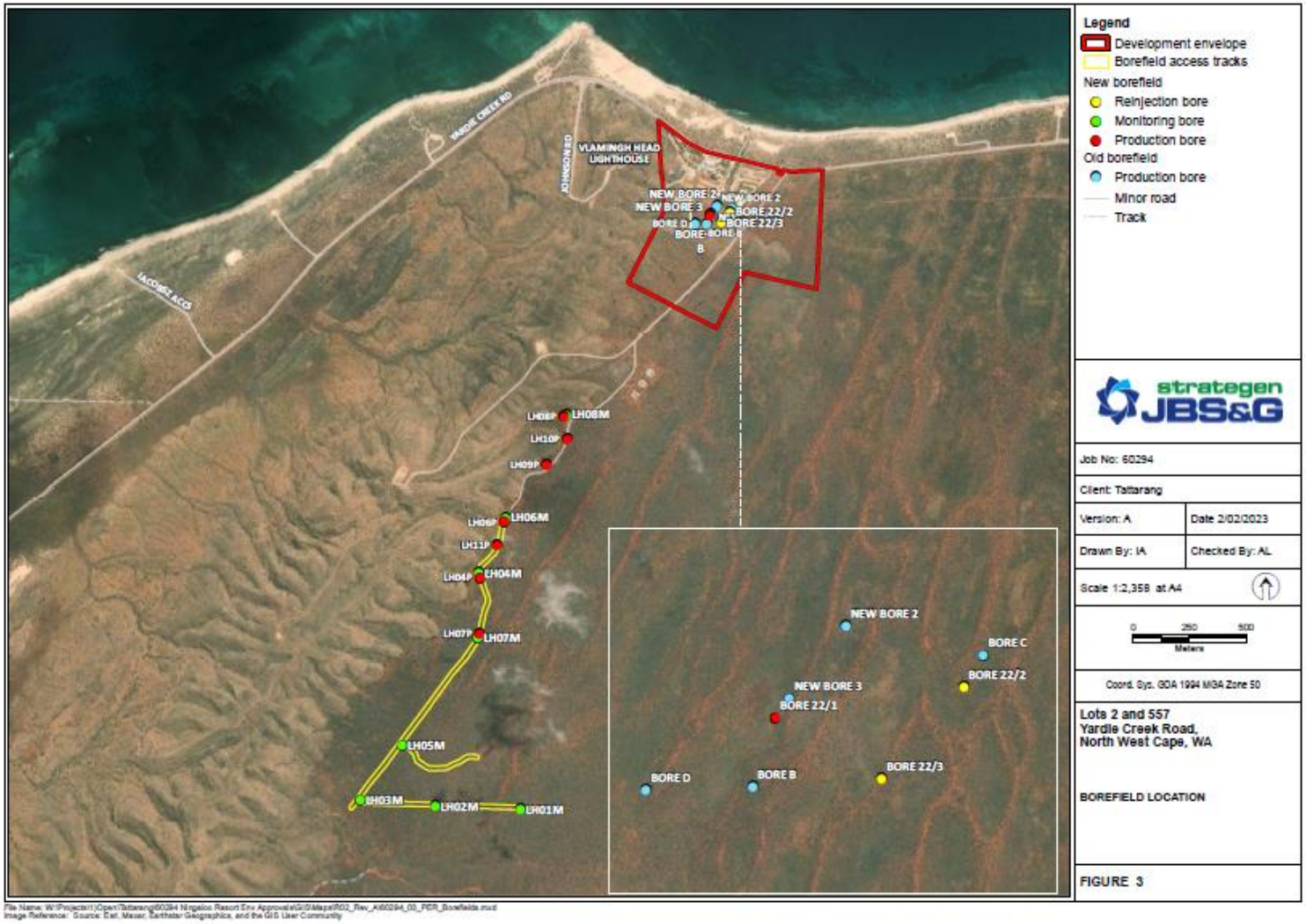


**Figure 2: Location and Proposed Extent of Physical and Operational Elements: Borefields**

# 2. Environmental Values

The Proposal is located within the Shire of Exmouth adjacent to Vlamingh Head on the northern extremity of North West Cape, approximately 1,270 km north of Perth. The Proposal is in the Gascoyne planning region, which includes internationally recognised conservation reserves comprising the Ningaloo Coast World Heritage Area, Ningaloo Marine Park, Nyinggulu Coastal Reserves, Cape Range National Park, and Jurabi and Bundegi Coastal Parks.

The Proposal lies within the terrestrial boundary of the coastal area of the Ningaloo Coast World Heritage Area and within the mapped boundary of the National Heritage Place.

The nearest town is Exmouth, approximately 18 km to the south of the Proposal (Figure 1). The Proposal is located approximately 10.7 km from the Naval Communications Station Harold E Holt.

This CEMP sets out the requirements for the management of Matters of National Environmental Significance (MNES) (under the EBPC Act) and the environmental factors (as considered by the EPA) under the EP Act, associated with the **construction phase** of the Proposal. The

## 2.1 Potential impacts to Matters of National Environmental Significance

The relevant controlling provisions and associated matters of national environmental significance (MNES) under the EPBC Act are as follows:

- **Listed threatened species and communities (sections 18 and 18A);**
- **Listed migratory species - Marine Turtles (sections 20 and 20A):**
  - Loggerhead turtle (*Caretta caretta*) - Endangered, Migratory, Marine;
  - Green turtle (*Chelonia mydas*) – Vulnerable, Migratory, Marine;
  - Hawksbill turtle (*Eretmochelys imbricata*) - Vulnerable, Migratory, Marine;
  - Flatback turtle (*Natator depressus*) - Vulnerable, Migratory, Marine;
  - Leatherback turtle (*Dermochelys coriacea*) – Endangered, Migratory, Marine;
- **Listed Threatened species and ecological communities (sections 18 and 18A):**
  - Cave Gudgeon (*Milyeringa veritas*) – Vulnerable;
  - Blind Cave Eel (*Ophisternon candidum*) – Vulnerable;
  - Black-flanked Rock Wallaby (*Petrogale lateralis lateralis*) – Endangered;
  - Australian Fairy Tern (*Stemula nereis nereis*) – Vulnerable;
- **Migratory Species (sections 20 and 20A):**
  - Osprey (*Pandion haliaetus cristatus*) – migratory;
- **World Heritage properties (sections 12 and 15A):**
  - Values of the Ningaloo Coast World Heritage Area;
- **National Heritage places (sections 15B and 15C):**
  - Values of the Ningaloo Coast National Heritage Place;
- **Commonwealth land (section 26 and 27A) – Defence equities on Commonwealth land:**
  - The Naval Communication Station Harold E Holt- Areas A, B, C, and the Space Surveillance Telescope (SST);
  - RAAF Base Learmonth (combined RAAF Air Base/ civilian airport); and

- Learmonth Solar Observatory.

## 2.2 Key environmental factors

The key environmental factors and associated Commonwealth Land values that have been identified as relevant to the Proposal include:

- Flora and Vegetation;
- Terrestrial Fauna;
- Subterranean Fauna;
- Marine Fauna;
- Inland Waters; and
- Social Surroundings (Aboriginal Heritage; Natural Heritage).

Other environmental factors and associated Commonwealth Land values, which are not considered to be key environmental factors are:

- Air Quality;
- Coastal Processes;
- Landforms;
- Terrestrial Environmental Quality;
- Marine Environmental Quality; and
- Greenhouse Gas Emissions.

A whole of environment assessment has been undertaken which addresses how impacts to each of the key Commonwealth Land environmental values have been addressed (Appendix A. These measures are included in this management plan.

## 2.3 Relevant activities, risks and potential impacts and risks

Table 1-1 identifies the potential construction activity risk events with respect to the key and other environmental factors and MNES. Mitigation of potential impacts to MNES have been considered in the context of the Commonwealth whole of environment, that is potential direct, indirect and off site impacts. Section 4 looks at potential impacts for various environmental components that collectively make up the environment, such as landforms, soils, water bodies (e.g. marine environment), plants, animals, human communities and heritage buildings or sites.

A risk assessment is provided in Section 3, Table 3-4 which considers the inherent risks, proposed management and mitigation measures and residual outcome. Additional details regarding proposed management measures are provided in Section 4.

**Table 2-1: Relevant activities, risks and impacts**

| Environmental Factor | MNES | Aspect / Activity | Risk Pathways | Potential Impacts |
|---|---|---|---|---|
| **Flora and Vegetation** | **Ningaloo Coast (World and National Heritage – Natural values)** | Clearing of native vegetation | Clearing outside of approved disturbance footprint<br>Dust from ground disturbing activities | Unauthorised vegetation disturbance resulting increased loss of conservation significant flora and vegetation<br>Introduction of, and/or spread of invasive species (weeds)<br>Altered fire regimes |
| | | Earthworks, civil works | Movement of vehicles/machinery outside of designated access tracks/roads<br>Unauthorised access to project area<br>Vehicles and machinery brought to site without being free of soil/plant material prior to entry<br>Dust from ground disturbing activities<br>Fire arising from hot works or vehicle movements | |
| **Terrestrial Fauna** | **Listed Threatened species and ecological communities**<br>• Black-flanked Rock Wallaby (*Petrogale lateralis lateralis*) – Endangered<br>• Australian Fairy Tern (*Stemula nereis nereis*)<br>**Migratory Species**<br>• Osprey (Pandion Haliatus cristatus)<br>**Ningaloo Coast (World and National Heritage – Natural values)** | Clearing of native vegetation | Clearing outside of approved disturbance footprint<br>Movement of vehicles/machinery outside of designated access tracks/roads | Unauthorised vegetation disturbance resulting increased loss of fauna habitat outside of / adjacent to approved footprint<br>Cumulative loss of habitat for conservation significant fauna<br>Altered fire regimes<br>Fauna injury or death from vehicle strike or bushfires<br>Temporary behavioural changes to terrestrial fauna due to noise and vibration |
| | | Earthworks, civil works | Movement of vehicles/machinery outside of designated access tracks<br>Unauthorised access to project area<br>Noise and vibration from vehicles and machinery<br>Fire arising from hot works or vehicle movements | |
| | | Excavation for removal of old, and installation of new, underground services such as water, wastewater, electricity, fuel tanks) | Open trenches – risk of fauna entrapment | Fauna injury or death from entrapment in trenches, entanglement with or ingestion of waste<br>Increase in predator activity (e.g. dingoes, foxes, cats) and predation due to increased access to food scraps |

| Environmental Factor | MNES | Aspect / Activity | Risk Pathways | Potential Impacts |
|---|---|---|---|---|
| | | Waste storage and handling | Uncontrolled release of liquid wastes<br>Inappropriate waste storage practices, such as lack of lids etc, resulting in windblown waste, access to predators and vermin | |
| | | Artificial lighting at night | Safety lighting at night | Disruption to seabird, shorebird or osprey breeding and foraging activities in nearby vegetation, dunes and adjacent beach |
| | | Construction workforce | Access to beach or bird nesting areas by construction workforce during work breaks outside of existing access ways<br>Domestic animals/pets being brought to the construction site | |
| **Marine Fauna – marine turtles** | **Listed Threatened species and ecological communities**<br>**Listed migratory species – Marine Turtles**<br>• Loggerhead turtle (*Caretta caretta*), Endangered (EPBC Act, BC Act)<br>• Green turtle (*Chelonia mydas*), Vulnerable (EPBC Act, BC Act)<br>• Hawksbill turtle (*Eretmochelys imbricata*), Vulnerable (EPBC Act, BC Act).<br>• Flatback turtle (*Natator depressus*) – Vulnerable, Migratory, Marine<br>• Leatherback turtle *(Dermochelys coriacea) – Endangered,* Migratory, Marine<br>**Ningaloo Coast (World and National Heritage – Natural values)** | Artificial lighting at night | Construction lighting and vehicle lights at night | Disruption to marine turtle breeding activities on adjacent beach<br>Predation of turtle hatchlings by pet dogs or cats |
| | | Construction workforce | Access to beach by construction workforce outside of existing dune access points<br>Domestic animals/pets being brought to the construction site | |
| | | Waste storage and handling | Inappropriate waste storage practices, such as lack of lids etc, resulting in windblown waste, access to predators and vermin | Increase in predator activity (e.g. dingoes, foxes, cats) and predation due to increased access to food scraps |

| Environmental Factor | MNES | Aspect / Activity | Risk Pathways | Potential Impacts |
|---|---|---|---|---|
| **Marine environmental quality** | **Ningaloo Coast (World and National Heritage – Natural values)** | Chemical, fuel and waste storage and handling | Spills of chemicals, fuels or liquid wastes to ground | Contaminated runoff during storm event reaching beach via dune swale runoff |
| | | | Inappropriate waste storage practices, such as lack of lids etc, resulting in windblown waste | Plastics and other litter resulting in marine debris |
| **Inland Waters** | **Ningaloo Coast (World and National Heritage – Natural values)** | Chemical, fuel and waste storage and handling<br>Removal of underground fuel tanks | Spills of chemicals, fuels or liquid wastes to ground | Contamination of surface water runoff, with subsequent contamination of groundwater |
| **Subterranean Fauna** | **Listed Threatened species and ecological communities**<br>• Cave Gudgeon (*Milyeringa veritas*) – Vulnerable<br>• Blind Cave Eel (*Ophistemon candidum)* – Vulnerable<br>**Ningaloo Coast (World and National Heritage – Natural values)** | Chemical, fuel and waste storage and handling<br>Removal of underground fuel tanks | Spills of chemicals, fuels or liquid wastes to ground | Contamination of groundwater by infiltration of spilled chemicals/fuels to ground |
| | | Water supply for dust suppression and domestic use (construction workforce) | Groundwater abstraction | Lowering of water table due to drawdown in borefield reducing volume of available habitat for subterranean fauna |
| **Social Surroundings – Aboriginal Heritage** | **Ningaloo Coast (World and National Heritage – Indigenous values)** | Clearing of native vegetation<br>Earthworks and civil works | Clearing outside of approved disturbance footprint | Unauthorised disturbance to known heritage sites<br>Disturbance to unknown sites as evidenced by discovery of artefacts or human remains |
| **Air Quality** | **Commonwealth equities (Department of Defence installations)** | Clearing of native vegetation<br>Earthworks and civil works, including demolition works | Dust emissions from vehicle and machinery movements on unsealed surfaces and during vegetation clearing and earthworks.<br>Removal and disposal of asbestos materials during demolition activities | Increased sky glow from artificial light and/or increased atmospheric dust negatively impacting on the dark sky qualities required for space surveillance telescope<br>Uncontrolled release of airborne hazardous materials (asbestos) |
| | | Artificial lighting at night | Construction lighting and vehicle lights at night | |

| Environmental Factor | MNES | Aspect / Activity | Risk Pathways | Potential Impacts |
|---|---|---|---|---|
| **Coastal Processes** | **Ningaloo Coast (World and National Heritage – Natural values)** | Construction workforce | Access to beach by construction workforce outside of existing dune access points | Erosion and damage to dune and foreshore vegetation |
| **Landforms** | **Ningaloo Coast (World and National Heritage – Natural values)** | Clearing of native vegetation<br>Earthworks and civil works | Clearing outside of approved disturbance footprint<br>Alteration of natural topography of the site | Disruption to scenic quality of the visual landscape when viewed from Vlamingh Head Lighthouse or the adjacent coastline |
| **Terrestrial environmental quality** | **Ningaloo Coast (World and National Heritage – Natural values)** | Clearing of native vegetation<br>Earthworks and civil works, including cut and fill and drainage work | Clearing outside of approved disturbance footprint<br>Alteration of natural topography of the site and changes to natural surface water drainage features | Soil erosion and sedimentation of natural drainage lines<br>Contaminated surface runoff offsite, or infiltrating to groundwater |
| **Greenhouse Gas Emissions** | **Ningaloo Coast (World and National Heritage – Natural values)** | Clearing of native vegetation<br>Earthworks and civil works | Degradation/breakdown of cleared vegetation<br>Emissions from vehicles and machinery<br>Consumption of electricity during construction activities | Contribution to global GHG concentrations from:<br>• Direct emissions from the clearing of native vegetation (carbon released) and operation of machinery and plant equipment (Scope 1 emissions); and<br>• Indirect emissions from the consumptions of electricity (Scope 2 emissions)<br>Loss of bio-sequestration capacity through direct loss of native vegetation |

# 3. Environmental Risk Assessment

A qualitative risk assessment was conducted in accordance with the DoTE (2014) *Environmental Management Plan Guidelines* to assess the risks of the development, as identified in Table 2-1. Each environmental risk identified has been provided a likelihood and consequence rating using the criteria in Table 3-1 and Table 3-2. These ratings are then combined using Table 3-3 to generate a risk rating (e.g. low, medium, high etc.) to inform the management of the risks. The resultant risk assessment is provided in Table 3-4.

For each impact identified in Table 3-4, a summary of the key management measures and a cross reference to the more detailed management tables within Section 4 is provided in the 'management' column of the Risk Assessment.

**Table 3-1: Likelihood of Occurrence (DotE 2014)**

| Qualitative Measures for likelihood (How likely is it that this event/issue will occur) | |
|---|---|
| Highly likely | Is expected to occur in most circumstances. |
| Likely | Will probably occur during the life of the project. |
| Possible | Might occur during the life of the project. |
| Unlikely | Could occur but considered unlikely or doubtful. |
| Rare | May occur in exceptional circumstances. |

**Table 3-2 Consequences (DotE 2014)**

| Qualitative Measures for consequence (what will be the consequence/result if this issue does occur rating) | |
|---|---|
| Minor | Minor incident of environmental damage that can be reversed. |
| Moderate | Isolated but substantial instances of environmental damage that could be reversed with intensive efforts. |
| High | Substantial instances of environmental damage that could be reversed with intensive efforts. |
| Major | Major loss of environmental amenity and real danger of continuing. |
| Critical | Severe widespread loss of environmental amenity and irrecoverable environmental damage. |

**Table 3-3 Risk Rating (DotE 2014)**

| Likelihood | Consequence | | | | |
|---|---|---|---|---|---|
| | Minor | Moderate | High | Major | Critical |
| Highly likely | Medium | High | High | Severe | Severe |
| Likely | Low | Medium | High | High | Severe |
| Possible | Low | Medium | Medium | High | Severe |
| Unlikely | Low | Low | Medium | High | High |
| Rare | Low | Low | Low | Medium | High |

**Table 3-4: Environmental Risk Assessment**

| Aspect / Activity | Risk Pathways | Potential Impacts | Inherent Risk Rating | | | Management | Residual Risk Rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | C | Risk | | L | C | R |
| Earthworks, civil works, and construction including clearing of native vegetation, cut and fill and drainage work | Clearing outside of approved disturbance footprint<br>Movement of vehicles/machinery outside of designated access tracks/roads | Unauthorised vegetation disturbance resulting increased loss of conservation significant flora and vegetation and/or fauna habitat outside of approved footprint | Possible | Moderate | Medium | Section 4.1.1<br>Demarcation and flagging of clearing areas | Rare | Moderate | Low |
| | | Unauthorised disturbance to known Aboriginal or European heritage sites | Possible | High | Medium | Section 4.1.4<br>Demarcation and flagging of sites to be protected | Rare | High | Low |
| | Ground disturbing activities | Disturbance to unknown sites as evidenced by discovery of artefacts or human remains | Possible | High | Medium | Section 4.1.4<br>Construction activities restricted to approved disturbed areas or areas approved to be cleared | Unlikely | High | Medium |
| | | Fugitive dust emissions | Likely | Moderate | Medium | Section 4.1.5<br>Water based dust suppression | Unlikely | Moderate | Low |
| | | Temporary behavioural changes to terrestrial fauna due to noise and vibration | Likely | Minor | Low | Section 4.1.3<br>Construction activities restricted to approved disturbed areas or areas approved to be cleared | Unlikely | Minor | Low |
| | | Fauna injury or death from vehicle strike | Possible | Moderate | Medium | Section 4.1.3<br>Construction activities restricted to approved disturbed areas or areas approved to be cleared | Rare | Moderate | Low |

| Aspect / Activity | Risk Pathways | Potential Impacts | Inherent Risk Rating | | | Management | Residual Risk Rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | C | Risk | | L | C | R |
| | Alteration of natural topography of the site | Disruption to scenic quality of the visual landscape when viewed from Vlamingh Head Lighthouse or the adjacent coastline. | Likely | Minor | Low | Section 4.1.13<br>Dust management | Possible | Minor | Low |
| | | Soil erosion and sedimentation of natural drainage lines and/or contaminated surface runoff offsite, or infiltrating to groundwater | Likely | Moderate | Medium | Section 4.1.10<br>Diversion of stormwater away from work areas; maintenance of drainage lines before and after rainfall events | Unlikely | Moderate | Low |
| | | Potential changes to vegetation structure and floristic composition in surrounding/adjacent areas through altered surface water drainage patterns and flows. | Possible | Moderate | Medium | Section 4.1.10<br>Maintenance of drainage lines before and after rainfall events | Rare | Moderate | Low |
| | Vehicles and machinery brought to site without being free of soil/plant material prior to entry<br>Unauthorised access to project area<br>Movement of vehicles/machinery outside of designated access tracks/roads | Introduction of, and/or spread of invasive species (weeds) | Likely | Moderate | Medium | Section 4.1.2<br>Vehicles and equipment required to be clean on entry<br>Weed spraying / removal | Unlikely | Moderate | Low |
| | Hot works or vehicle movements | Bushfire (altered fire regimes) | Unlikely | High | Medium | Section 4.1.9<br>Hot work permits<br>No fires on site | Rare | High | Low |
| | Dust emissions from vehicle and machinery movements on unsealed surfaces and during vegetation clearing and earthworks. | Increased sky glow from artificial light and/or increased atmospheric dust negatively impacting on the dark sky qualities required for space surveillance telescope | Likely | Moderate | Medium | Section 4.1.5<br>Water based dust suppression | Unlikely | Moderate | Low |

| Aspect / Activity | Risk Pathways | Potential Impacts | Inherent Risk Rating | | | Management | Residual Risk Rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | C | Risk | | L | C | R |
| | | Potential reduction in vegetation health as a result of dust generation during construction | Possible | Moderate | Medium | Section 4.1.5<br>Water based dust suppression | Rare | Moderate | Low |
| | Removal and disposal of asbestos materials during demolition activities | Uncontrolled release of airborne hazardous materials (asbestos) | Possible | Moderate | Medium | Section 0<br>Asbestos to be wrapped prior to disposal<br>Water based dust suppression | Rare | Moderate | Low |
| Excavation for removal of old, and installation of new, underground services such as water, wastewater, electricity, fuel tanks) | Open trenches – risk of fauna entrapment | Fauna injury or death from entrapment in trenches | Likely | Moderate | Medium | Section 4.1.3<br>Daily inspection of open excavations for trapped fauna | Unlikely | Moderate | Low |
| Waste storage and handling | Uncontrolled release of liquid wastes<br>Inappropriate waste storage practices, such as lack of lids etc, resulting in windblown waste, access to predators and vermin | Fauna injury or death from entanglement with, or ingestion of, waste | Possible | Moderate | Medium | Section 4.1.3<br>Wastes segregated and stored in bins with fitted lids | Rare | Moderate | Low |
| | | Increase in predator activity (e.g. dingoes, foxes, cats) and predation due to increased access to food scraps | Possible | Moderate | Medium | Section 0<br>Wastes segregated and stored in bins with fitted lids | Unlikely | Moderate | Low |
| | | Plastics and other litter resulting in marine debris | Possible | Moderate | Medium | Section 0<br>Wastes segregated and stored in bins with fitted lids | Unlikely | Moderate | Low |
| Removal of underground fuel tanks | Spills of chemicals, fuels or liquid wastes to ground | Contamination of surface water runoff, with subsequent contamination of groundwater | Possible | High | Medium | Section 0<br>Fuels and chemicals stored within containers in bunded areas | Rare | High | Low |

| Aspect / Activity | Risk Pathways | Potential Impacts | Inherent Risk Rating | | | Management | Residual Risk Rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | C | Risk | | L | C | R |
| | | | | | | Stormwater diverted away from chemical storage areas | | | |
| Water supply for dust suppression and domestic use (construction workforce) | Groundwater abstraction | Lowering of water table due to drawdown in borefield reducing volume of available habitat for subterranean fauna | Unlikely | High | Medium | Section 4.1.11<br>Groundwater abstraction in accordance with groundwater licence | Rare | High | Low |
| Construction workforce | Access to beach (marine turtle, bird nesting areas) by construction workforce during work breaks outside of existing dune access points | Erosion and damage to dune and foreshore vegetation | Unlikely | Moderate | Low | Section 4.1.4<br>Workforce induction | Rare | Moderate | Low |
| | | Disruption to marine turtle breeding activities or seabird, shorebird or osprey breeding and foraging activities in nearby vegetation, dunes and adjacent beach | Possible | Moderate | Medium | Section 4.1.4<br>Workforce induction | Unlikely | Moderate | Low |
| | Domestic animals/pets being brought to the construction site | Increased predation of turtle hatchlings and /or shorebirds by pet dogs or cats | Possible | Moderate | Medium | Section 0<br>No pets allowed on site | Rare | Moderate | Low |
| Artificial lighting at night | Construction lighting and vehicle lights at night | Disruption to marine turtle breeding activities or seabird, shorebird or osprey breeding and foraging activities in nearby vegetation, dunes and adjacent beach | Unlikely | Moderate | Medium | Section 4.1.6<br>No night works during marine turtle breeding season (November-March)<br>No external lighting at night during construction phase other than minimum required for safety | Rare | Moderate | Low |

| Aspect / Activity | Risk Pathways | Potential Impacts | Inherent Risk Rating | | | Management | Residual Risk Rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | C | Risk | | L | C | R |
| | | | | | | | | | |
| | | Increased sky glow from artificial light and/or increased atmospheric dust negatively impacting on the dark sky qualities required for space surveillance telescope | Unlikely | Moderate | Medium | Section 4.1.5, 4.1.6<br>No night works<br>No external lighting at night during construction phase other than minimum required for safety<br>Water based dust suppression | Rare | Moderate | Low |
| All construction activities | Degradation/breakdown of cleared vegetation<br>Emissions from vehicles and machinery<br>Consumption of electricity during construction activities | Contribution to global GHG concentrations from:<br>Direct emissions from the clearing of native vegetation (carbon released) and operation of machinery and plant equipment (Scope 1 emissions); and<br>Indirect emissions from the consumptions of electricity (Scope 2 emissions)<br>Loss of bio-sequestration capacity through direct loss of native vegetation | Likely | Moderate | Medium | Section 0<br>Clearing of vegetation restricted to approved disturbance footprint<br>Vehicles serviced and maintained | Likely | Moderate | Medium |

# 4. Environmental Management, Monitoring and Reporting

Each of the sections below describes the management activities and performance targets or outcomes to be achieved, monitoring programs, corrective actions and reporting requirements relevant to the impacts identified in the risk assessment in Table 3-4.

### 4.1.1 Clearing of Native Vegetation

The proposed management measures that will be implemented to prevent and monitor unauthorised disturbance or clearing of native vegetation; and contingency and corrective actions, are described in Table 4-1.

**Table 4-1: Unauthorised Disturbance Of Native Vegetation Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Disturbance to, and clearing of, native vegetation:<br>• is limited to the mapped project disturbance footprint at all times; and<br>• does not exceed the authorised extent of 3.97 ha at all times | Demarcate approved clearing area using GPS Coordinates and flagged star pickets, with the area beyond the authorised limited clearly flagged as 'no go zones'. | Prior to clearing | GPS records maintained of areas cleared | Daily during clearing | Vegetation Clearing Register |
| | Pre-clearance ground check for terrestrial fauna within areas of native vegetation to be cleared, and removal in accordance with DBCA Parks and Wildlife Service Standard Operating Procedures if encountered. | Prior to clearing. | Records maintained of fauna observations and removal prior to clearing. | Prior to commencement of clearing. | Vegetation Clearing Register |
| | Any Priority flora or habitat within the authorised clearing area is to be flagged and recorded for reporting purposes. | Prior to clearing | GPS records maintained for any Priority flora or habitat within the authorised clearing area | At the end of clearing | Vegetation Clearing Register |
| | Demarcate known locations of Priority flora close to, but outside the disturbance footprint will be demarcated as "No-Go Zones". | Prior to clearing | GPS records maintained of demarcated no go zones, and areas cleared. | At the end of clearing | Vegetation Clearing Register |
| | Restrict access by personnel, vehicles and equipment to designated clearing areas and existing disturbed areas, including tracks and roads, | At all times | Visual monitoring of flagging and temporary fencing is intact, and no breach has occurred, and no new project | Weekly | Environmental Checklist |

| | | | | | |
|---|---|---|---|---|---|
| | within the Development Envelope.<br>Access tracks closed to prevent unauthorised access, when not in use by project vehicles. | | related tracks created outside of approved clearing areas. | | |
| | Stockpile all cleared native vegetation for use on site as part of landscaping / rehabilitation of existing disturbed areas, within cleared areas within the Development Envelope. | During and after clearing | Visual monitoring of stockpiles of cleared material. | Weekly and at the completion of clearing | Environmental Checklist |
| | All site personnel and visitors to undergo site induction which contains information on clearing restrictions. | Prior to entry to site for the first time. | Review of induction records to ensure completion | Weekly | Environmental Checklist<br>Induction records |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Approved clearing boundary is breached<br>Or<br>Approved clearing extent is breached | Immediately Report Incident to Construction Contractor Supervisor.<br>Construction Contractor Supervisor to report to Project Manager and commence investigation. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Potential Non Compliance report to EPA and DCCEEW<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.2 Weed Management

The proposed management measures that will be implemented to prevent and monitor the spread of weeds; and contingency and corrective actions, are described in Table 4-2.

**Table 4-2: Weed Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Prevent the introduction and spread of environmental weeds as result of construction activities within the Development Envelope and in the areas of Jurabi Coastal Park and unallocated Crown Land immediately adjacent to the Proposal. | All vehicles and machinery are free of soil and plant material prior to entry to the site | Prior to entry to site | Visual inspection of vehicles and machinery | Upon entry to site | Weed and Hygiene Inspection Register |
| | Clean vehicles/machinery of all dirt and material within a designated vehicles at designated clean/wash down station prior to allowing entry. | Prior to entry to site | Visual inspection of vehicles and machinery | Upon entry to site | Weed and Hygiene Inspection Register |
| | Completion of Weed and Hygiene Inspection Register | Upon arrival to site | Visual inspection of weed and hygiene register | Weekly | Environmental Checklist |
| | Restrict access by personnel, vehicles and equipment to designated clearing areas and existing disturbed areas, including tracks and roads, | At all times | Visual monitoring of flagging and temporary fencing is intact, and no breach has occurred, and no new project | Weekly | Environmental Checklist |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | within the Development Envelope.<br>Access tracks closed to prevent unauthorised access, when not in use by project vehicles. | | related tracks created outside of approved clearing areas. | | |
| | All site personnel and visitors to undergo site induction which contains information on weeds and known location of weeds on site. | Prior to entry to site for the first time. | Review of induction records to ensure completion | Weekly | Environmental Checklist<br>Induction records |
| | Engage a suitably qualified weed control contractor to develop weed management plan, that includes any known Declared plants. | Prior to earthworks | Review of weed control plan | Prior to earthworks commencing | Weed control plan<br>Environmental Checklist |
| | Known locations of weeds within the disturbance footprint will be demarcated (e.g. by flagging) | Prior to earthworks | GPS records of demarcated weed locations | Prior to earthworks commencing | Environmental Checklist |
| | Inspection for and spraying of weeds within the Development Envelope and areas immediately adjacent to the property throughout the construction period | As required | Visual inspection of construction site for evidence of weeds | Weekly | Environmental Checklist |
| | Any soil or vegetative material containing weeds is to be stockpiled and managed to prevent the spread to uninfected areas. The stockpile areas will be signed and maintained within soil bunded area to restrict movement of | During earthworks | Visual inspection of construction site for evidence of weed contaminated soil stockpiles | Weekly | Environmental Checklist |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | weed seeds and propagating material in the event of rainfall. | | | | |
| | Removal of planted non-native landscaping species existing within the old resort site | During construction and prior to landscaping | Visual inspection to confirm non-native landscape species removed | At end of construction | Environmental Checklist |
| | All site personnel and visitors to undergo site induction which contains information on weed management. | Prior to entry to site for the first time. | Review of induction records to ensure completion | Weekly | Environmental Checklist<br>Induction records |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Plant or soil material discovered on vehicles or machinery arriving to site. | Clean vehicles/machinery of all dirt and material within a designated vehicles at designated clean/wash down station prior to allowing entry.<br>Complete Weed and Hygiene Inspection Register and report Incident to Construction Contractor Supervisor. | Construction contractor to ensure Weed and Hygiene register is completed by operators bringing vehicles/machinery to site.<br>All personnel required to report environmental incidents.<br>Construction Contractor Supervisor responsible for internal reporting. | Weed and Hygiene Inspection Register<br>Incident and complaints register<br>Environmental Inspection Form | Potential Non Compliance report to EPA and DCCEEW<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Weed populations discovered within the Development Envelope during site inspections or reported by contractors | Undertake weed spraying/removal program using a suitably qualified weed control contractor.<br>Report Incident to Construction Contractor Supervisor | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for weed management and internal reporting. | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.3 Fauna Management

The proposed management measures that will be implemented to manage fauna, and contingency and corrective actions, are described in Table 4-3.

**Table 4-3: Fauna Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Disturbance to, and clearing of, of native vegetation:<br>• is limited to the mapped project disturbance footprint at all times; and<br>• does not exceed the authorised extent of 3.97 ha at all times | Restrict access by personnel, vehicles and equipment to designated clearing areas and existing disturbed areas, including tracks and roads, within the Development Envelope.<br>Access tracks closed to prevent unauthorised access, when not in use by project vehicles. | At all times | Visual monitoring of flagging and temporary fencing is intact, and no breach has occurred, and no new project related tracks created outside of approved clearing areas. | Weekly | Environmental Checklist |
| | Clearing undertaken in a slow and progressive manner from one direction to the other (e.g. west to east) to allow fauna to move to adjacent native vegetation. | During clearing of native vegetation | Visual monitoring for injured fauna. | Daily during clearing activities | Environmental Checklist<br>Incident Records |
| Prevent project related indirect disturbance to nesting marine turtles; seabirds or shorebirds or marine raptors | No night works or external night lights | At all times | Visual inspection upon closing the site at the end of each day. | Daily, with weekly review of site records | Environmental Checklist |
| Prevent injury or death of native fauna as a result of construction activities | Maintain posted speed limit within construction areas (<40 km/hr) | At all times | Visual monitoring for injured fauna | Daily, with weekly review of site records | Environmental Checklist<br>Incident Records |
| | No pets allowed within the site during construction activities | At all times | Visual monitoring of site for evidence of pets. | Daily, with weekly review of site records | Environmental Checklist<br>Incident Records |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | All food scraps and wastes disposed of within bins with fitted lids | At all times | Visual monitoring for evidence of litter or wind-blown waste | Daily, with weekly review of site records | Environmental Checklist<br>Incident Records |
| | All open excavations to have fauna egress matting in place, while the excavation is open | At all times | Visual monitoring of open excavations (e.g. trenches) for trapped fauna. | Daily at the start and end of each shift. | Environmental Checklist<br>Incident Records |
| | Any fauna capture, handling and relocation will be conducted in accordance with Department of Biodiversity, Conservation and Attractions Parks and Wildlife Service Standard Operating Procedures, by a licensed fauna handler. | In the event of fauna removal | Records maintained of fauna species, relocation details and name and contact details of licensed fauna handler. | As required. | Incident Records |
| | Undertake trapping or other methods of control for feral pests (cats, foxes, rabbits) on the advice of DBCA | During construction phase if pests are observed adjacent to or within the development envelope | Visual monitoring for evidence of feral pests and record of control measures maintained | Weekly | Environmental Checklist<br>Feral animal control records |
| | All site personnel and visitors to undergo site induction which contains information on fauna management, including marine seabirds and fauna. | Prior to entry to site for the first time. | Review of induction records to ensure completion | Weekly review of site records | Environmental Checklist<br>Induction records |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Injury or death of fauna (including seabirds, or shorebirds) observed or reported within the Development Envelope or the adjacent roadside or dunes. | Immediately Report Incident to Construction Contractor Supervisor, who will contact the local Veterinarian and/or local DBCA office for advice and/or to attend the injured animal.<br>Any injured fauna to be protected from further injury or harm and observed until a suitably qualified fauna expert or veterinarian can attend to the animal.<br>Once the animal has been attended to investigate the cause of the incident.<br>If euthanasia is required, this shall be undertaken humanely in accordance with instructions and advice from DBCA or qualified Veterinarian.<br>Dead animals to be moved away from roadside into adjacent vegetation.<br>Investigate likely cause of injury or death.<br>Review management measure and Implement changes as required to prevent further fauna to ensure the incident does not re-occur (e.g., lower site speed limit to <10 km/hr).<br>Construction Contractor Supervisor to report to Project Manager to enable any external reporting to be undertaken. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Potential Non Compliance report to EPA and DCCEEW<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Trapped fauna discovered within trench | Immediately Report Incident to Construction Contractor Supervisor<br>Remove fauna if safe to do so, without causing injury to the animal. Seek assistance from DBCA or local vet if required. Allow fauna to move away safely. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

| | | | | |
|---|---|---|---|---|
| | Any fauna capture, handling and relocation will be conducted in accordance with DBCA and Wildlife Service Standard Operating Procedures, by a licensed fauna handler.<br>If snakes are trapped within the excavation, contact local snake handler. Do not attempt to catch or remove snakes. | | | |

### 4.1.4 Protection of Aboriginal and European Heritage Sites and Natural Heritage Values

The proposed management measures that will be implemented to prevent and monitor unauthorised disturbance to heritage areas; and contingency and corrective actions, are described in Table 4-4.

**Table 4-4: Aboriginal, European and Natural Heritage Values Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Site access and construction activities are restricted to existing disturbed areas, access tracks and areas approved for clearing, as shown in Figure 2, at all times. | Demarcate heritage sites and 'no go' areas using GPS Coordinates and flagged star pickets | Prior to clearing | GPS records maintained of areas cleared | Daily during clearing | Vegetation Clearing Register |
| | Restrict access by personnel, vehicles and equipment to designated clearing areas and existing disturbed areas, including tracks and roads, within the Development Envelope.<br>Access tracks closed to prevent unauthorised access, when not in use by project vehicles. | At all times | Visual monitoring of flagging and temporary fencing is intact, and no breach has occurred, and no new project related tracks created outside of approved clearing areas. | Daily | Environmental Checklist |
| | Construction workforce accessing the beachfront during work breaks to access the beach via existing tracks to minimise erosion or damage to dune vegetation. | At all times | Visual monitoring | Weekly | Environmental Checklist |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | No pets to be brought to the work site. | At all times | Visual monitoring | Weekly | Environmental Checklist |
| | All activities to be undertaken in accordance with the requirements of the Cultural Heritage Management Plan | At all times | Visual monitoring | Annual | Audit of Records |
| | All site personnel and visitors to undergo site induction which contains information on locations to be avoided; requirements of the Cultural Heritage Management Plan; and restrictions on approaching nesting birds or marine turtles. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly checklist | Training records<br>Cultural Heritage Management Plan |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Approved clearing boundary is breached<br>Or<br>Approved clearing extent is breached | Immediately Report Incident to Construction Contractor Supervisor<br>Construction Contractor Supervisor to report to Project Manager<br>Commence visual inspection of mapped heritage areas to determine if they have been impacted. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Potential Non Compliance report to EPA and DCCEEW<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Disturbance to mapped heritage area(s) observed. | Undertake investigation and internal and external reporting obligations. | Construction Contractor Supervisor responsible for | Incident and complaints register | Potential Non Compliance report to EPA and DCCEEW |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| | Implement additional corrective actions as may be required by regulatory authorities. | internal reporting and investigation<br>Project Manager responsible for external reporting and directing any additional corrective actions required. | Environmental Inspection Form | Reporting to Registrar of Aboriginal Sites<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Discovery of Aboriginal artefacts or human remains | In the event of discovery of human remains:<br>• Stop work and immediately report incident to Construction Contractor Supervisor.<br>• Demarcate the area and prevent further access.<br>• Construction Contractor Supervisor to immediately contact Police, and report to Project Manager.<br>• Manage remains in accordance with legal requirements and the Cultural Heritage Management Plan.<br>In the event of discovery of likely aboriginal artefacts:<br>• Leave in situ, demarcate to prevent further access<br>• Immediately report incident to Construction Contractor Supervisor<br>• Construction Contractor Supervisor to report Project Manager, to enable reporting to Registrar of Aboriginal Sites and undertake actions as directed by the Department of Lands.<br>• Manage artefacts in accordance with the Cultural Heritage Management Plan. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting and directing any additional corrective actions required | Incident and complaints register<br>Environmental Inspection Form | Potential Non Compliance report to EPA and DCCEEW<br>Reporting to Registrar of Aboriginal Sites<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Disturbance to nesting turtles, hatchlings or nesting seabirds or shorebirds by site personnel observed or reported | Report incident to Construction Contractor Supervisor.<br>Investigate reports and take appropriate disciplinary action as may be appropriate.<br>Manage any fauna incidents in accordance with Section 4.1.3. | | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.5 Air Quality

The proposed management measures that will be implemented to prevent and monitor air quality; and contingency and corrective actions, are described in Table 4-5.

**Table 4-5: Air Quality Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Minimise dust emissions arising from construction activities | Use water based dust suppression (e.g. sprinklers, water carts) to minimise dust emissions during clearing of native vegetation and within cleared areas and on unsealed access ways. | At all times | Visual inspection of work sites for evidence of dust | Daily, with weekly review of site records | Environmental Checklist |
| | Stabilisation of cleared areas to be undertaken as soon as practicable, which involve mulching or commencement of landscaping activities. | Following completion of clearing | | Weekly | Environmental Checklist |
| | Vehicles and equipment access limited to designated roads/access tracks and cleared areas. | At all times | | Daily, with weekly review of site records | Environmental Checklist |
| | Reduced speed limit within the project area (<40 km/hr) | At all times | | Daily, with weekly review of site records | Environmental Checklist |
| | All site personnel and visitors to undergo site induction which contains information on dust management. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly checklist | Training records |
| | Saline water (>5000 mg/L TDS) will not be used for dust suppression | At all times | Visual inspection of records of water supply used for dust suppression | Weekly | Environmental Checklist |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Excessive dust movement observed moving off site or impacting areas of retained vegetation after implementing dust control measures.<br>Or<br>External complaint (e.g. from community or DoD) | Stop works and investigate the cause of dust movement (severe weather conditions or faulty dust suppression equipment).<br>If weather conditions are the cause of ineffective dust suppression, do not recommence works until weather is favourable<br>If dust suppression equipment is faulty, fix equipment.<br>Only recommence works once dust suppression is effective.<br>If a complaint was received, communicate outcome of investigation and measures taken to reduce dust. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.6 Lighting

The proposed management measures that will be implemented to manage lighting during construction; and contingency and corrective actions, are described in Table 4-6. The Proponent will consult with the Department of Defence regarding lighting management throughout the construction and operations phase of the Proposal to manage dark sky values required for the Space Surveillance Telescope.

**Table 4-6: Lighting Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Minimise external light emissions associated with construction activities | No night works during marine turtle breeding season. | November- March (inclusive of nesting and hatching) | Visual inspection of work sites upon completion of daily works to ensure external lighting is off. | Weekly checklist | Environmental Checklist |
| | Night works outside of turtle nesting and hatchling season limited to internal works. | At all times outside of turtle breeding season (November-March) | | Weekly checklist | |
| | External lighting at night limited to minimum required for safety | At all times, unless authorised for internal fit-out work | | Weekly checklist | |
| | Vehicle lighting limited to transit to and from site, with | At all times | | Weekly checklist | Environmental Checklist |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | parking within designated cleared areas on site. | | | | |
| | Artificial lighting at night to be managed and monitored in accordance with the approved ALMP and TMP | At all times | Audit of compliance with ALMP and TMP | Annual | Annual compliance report |
| | All site personnel and visitors to undergo site induction which contains information on light management and operating hours. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly checklist | Training records |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| External lighting observed to be switched on, on arrival to site at the start of the day. | Incident reported to Construction Contractor Supervisor.<br>Site personnel reminded of requirement to turn off external lighting via toolbox meeting. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Concerns regarding lighting from DoD | Incident reported to Construction Contractor Supervisor.<br>Proponent to liaise directly with DoD contact(s) to determine appropriate corrective actions required. | Construction Contractor Supervisor responsible for internal reporting and investigation<br>Proponent responsible for direct communication with DoD | Incident and complaints register | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.7 Waste Management

The proposed management measures that will be implemented to manage waste, contingency and corrective actions, are described in Table 4-7.

**Table 4-7: Waste Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| All waste materials generated during construction activities removed for offsite disposal or recycling. | Bins with fitted lids provided on site for storage of waste and litter | At all times | Visual inspection of work areas. | Weekly | Environmental Checklist |
| | Inert waste stockpiled within cleared areas pending removal for disposal / recycling. | At all times | | Weekly | Environmental Checklist |
| | All waste is appropriately contained within designated bins or stockpile areas during construction activities | At all times | | Weekly | Environmental Checklist |
| | Asbestos and waste material containing asbestos to be separated from other materials where possible and wrapped in a manner that prevents asbestos fibres entering the atmosphere during transport. The material must be labelled with the words 'CAUTION ASBESTOS' in letters not less than 50 millimetres (mm) high; and inform the person who operates or controls the waste facility that the material is or contains asbestos. | At all times prior to removal from site. | | Weekly | Waste transfer and disposal facility receipts.<br>Environmental Checklist |
| | Liquid controlled waste, including all waste hydrocarbons and chemicals, are contained with bunded storage (self-bunded or within trays) pending offsite disposal. | At all times | | Weekly | Environmental Checklist |
| | No wastes disposed of on site | At all times | Visual inspection of site records | Weekly | Environmental Checklist<br>Waste transfer and/or disposal records |
| | Wastewater (sewage) to be contained for offsite disposal or otherwise discharged to the existing lined sewage ponds. | At all times | Visual inspection | Weekly | Environmental Checklist<br>Waste transfer and/or disposal records |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | Waste removal records retained on site. | At all times | Visual inspection of site records | Weekly | Environmental Checklist<br>Waste transfer and/or disposal records |
| | All site personnel and visitors to undergo site induction which contains information on waste management. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly | Training records |
| No evidence of historical waste dumps within the Development Envelope. | Historical wastes dumped within the Development Envelope are removed from the site for recycling or disposal via appropriately licensed facility. | Prior to handover to operations. | Visual inspection of the site | Weekly and prior to handover to operations. | Waste transfer / disposal records<br>Environmental Checklist |
| Disused underground fuel storage (UST's) tanks removed in accordance with Australian Standard AS4976-2008 with tanks, associated infrastructure and any contaminated soil removed for offsite disposal. | All residual liquid from the UST's will be removed and disposed of at an appropriately licensed waste facility via appropriate vacuum truck as per liquid waste classification.<br>Where pipework cannot be drained back to the tank, draining's shall be collected and transferred to sealed drums for safe disposal.<br>Excavate and remove the 3 UST's.<br>Remove all associated ancillary infrastructure including but not limited to breathers, footings, bowsers etc.<br><br>Excavated soil to be stored on hardstand and sampled for contaminants in accordance with A 4976-2008. If the material exceeds contaminant levels, it shall be removed for offsite approval. | UST removal activities | Visual inspection of the site | Daily during and upon completion of tank removal activities | Waste transfer / disposal records<br>Soil testing records<br>Tanks destruction certificate<br>Environmental Checklist |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | Once the pit is validated, suitable material will be used to reinstate the tank pit void and compacted according to site requirements.<br><br>If the tanks cannot be processed by the scrap metal facility in its original form, then it will be cut up by an excavator on site using hydraulic metal shears and loaded into scrap metal bins or trucks for transportation. A tank destruction certificate will be provided for all tanks taken off site or destroyed on site. Any remaining redundant pipework associated with the tank will be drained and disposed of. | | | | |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Windblown litter or waste from construction activities observed on site or within immediate vicinity of the Development Envelope | Incident reported to Construction Contractor Supervisor.<br>Wastes removed for offsite disposal and investigation undertaken.<br>Site personnel reminded of requirement to turn off waste storage and removal requirements via toolbox meeting. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Unauthorised Discharge Report if criteria are met.<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Unauthorised waste disposal observed on site | | | | |
| Spills of liquid wastes reported or observed on stie | Incident reported to Construction Contractor Supervisor.<br>Wastes removed for offsite disposal and investigation undertaken.<br>Contaminated soil removed for offsite disposal.<br>Review of integrity of storage container and bunding and replace as required. | | | Unauthorised Discharge Report if criteria are met.<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.8 Fuel and Chemical Storage

The proposed management measures that will be implemented to manage fuel and chemical storage, and contingency and corrective actions, are described in Table 4-8.

**Table 4-8: Fuel and Chemical Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| No hydrocarbon contamination of soils and/or stormwater as a result of fuel and chemical fuel storage, vehicle refuelling activities and installation of service station. | All hydrocarbons and chemicals, are contained with bunded storage (self-bunded or within trays) | At all times | Visual inspection of work sites upon completion of daily works | Daily, with weekly review of site records | Environmental Checklist |
| | Spill kits are maintained in vehicle/machinery refuelling areas | At all times | | Daily, with weekly review of site records | Environmental Checklist |
| | All site personnel and visitors to undergo site induction which contains information on chemical and fuel management. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly checklist | Training records |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Spills of fuels and/or chemicals reported or observed on stie | Incident reported to Construction Contractor Supervisor.<br>Spilled removed for offsite disposal and investigation undertaken.<br>Contaminated soil removed for offsite disposal.<br>Contaminated stormwater pumped into containers for offsite disposal (if practicable)<br>Review of integrity of storage container and bunding and replace as required. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Unauthorised Discharge Report if criteria are met.<br>Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.9 Fire Prevention

The proposed management measures that will be implemented to prevent bushfires; and contingency and corrective actions, are described in Table 4-9.

**Table 4-9: Fire Prevention and Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| No construction related bushfires within the Development Envelope or the immediate vicinity of the site. | No burning of wastes or other deliberately lit fires or open fires on site. | At all times | Visual inspection of work site and site records | Daily, with weekly review of site records | Environmental Checklist |
| | Hot works to be undertaken in accordance with site hot works permits. | At all times | | Weekly review of site records | Environmental Checklist<br>HSE Permit Records |
| | Smoking only to be undertaken in designated smoking area | At all times | | Weekly | Environmental Checklist |
| | Fire extinguishers to be maintained on site and in vehicles/machinery used to clear native vegetation. | At all times | | Weekly | Environmental Checklist |
| | Vehicle undersides are to be regularly (e.g., at daily pre-starts, during and after use) and checked for any material stuck around the exhaust system, and any identified material removed. | Daily | | Daily | Pre-start checklist |
| | All flammable and combustible materials are to be appropriately stored and isolated at all times in accordance with AS1940:2017 | At all times | | Weekly | Environmental Checklist |
| | All site personnel and visitors to undergo site induction which contains information on fire prevention. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly checklist | Training records |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Unauthorised or uncontrolled fires observed or reported on site or the immediate vicinity | Incident reported to Construction Contractor Supervisor.<br>Fire extinguishers or site firefighting equipment used for initial spot fires, if safe to do so.<br>Fire brigade contacted immediately.<br>Investigation into cause of fire and revision of fire prevention measures to be undertaken. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.10 Stormwater Management

Exmouth, and the Proposal area, is located within a hot desert climate (BWh Köppen-Geiger classification). The average annual rainfall for Exmouth town is 270 mm with an average of 27 rain days per year, much of it being in May and June, or associated with cyclonic activity. The mean number of days where rainfall >1 mm is 2 days or less for much of the year, with 3 to 4 days occurring in February, May and July (BOM 2022). This results in short rainfall and runoff events, and it is not uncommon for surface flows in drainage lines to be completely lost to infiltration. When the area is subject to cyclonic activity, it is common for rainfall associated with these events to result in significant surface runoff (S Martens et al 2000). This is important in terms of stormwater management measures for both construction and operations.

The proposed management measures that will be implemented to manage stormwater, contingency and corrective actions, are described in Table 4-10.

**Table 4-10: Stormwater Management Measures**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| No contamination of site runoff, or erosion, as a result of construction activities | Stormwater diverted from active work areas, including waste and chemical storage, using diversion drains and bunds and natural drainage channels to enable disposal via infiltration where possible. | At all times | Visual inspection of work site | Daily, with weekly review of site records | Environmental Checklist |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | Work areas kept clean and waste materials regularly removed from site. | At all times | Visual inspection of work site | Prior to forecast storm or cyclone events | Environmental Checklist<br>Waste Records |
| | Chemical and fuel storage areas maintained in clean and tidy condition, with lids in place on all containers and bunds kept free of rubbish or liquids | At all times | Visual inspection of work site | Prior to forecast storm or cyclone events | Environmental Checklist |
| | All site personnel and visitors to undergo site induction which contains information on stormwater management. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly checklist | Training records |
| No build-up of sediment within drainage channels (to enable storm flow and minimise risk of flooding and erosion) | Sediment regularly removed from drainage channels before and after rainfall events. | Prior to forecast significant rainfall events and post rainfall events | Visual inspection of main drainage lines within the Development Envelope | Immediately prior to forecast rainfall / storm events and following rainfall events. | Environmental Checklist |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Erosion observed or reported within the Development Envelope following rainfall events to be | Incident reported to Construction Contractor Supervisor.<br>Erosion repaired, drainage channels inspected, and sedimentation and debris removed. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Construction waste, litter or debris observed or reported in drainage lines post rainfall events. | Incident reported to Construction Contractor Supervisor.<br>Debris removed and disposed of correctly.<br>Site inspected for source of debris and review of waste handling and management and site drainage undertaken to prevent further recurrence. | | | |

### 4.1.11 Groundwater management

The proposed management measures that will be implemented to protect groundwater; monitoring and contingency and corrective actions, are described in Table 4-11. Groundwater monitoring and management associated with abstraction from the southern borefield will be undertaken in accordance with the approved IWQMP.

**Table 4-11: Groundwater management**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Groundwater abstraction undertaken in accordance with licensed abstraction volume | Record water usage from borefield | Monthly from commencement of use of borefield | Water meter readings | Monthly | Groundwater meter records |
| | Report annual water abstraction to DWER in accordance with groundwater licence | Annual | | Annual | Annual groundwater use report |
| | All site personnel and visitors to undergo site induction which contains information on water usage. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly review of site records | Training records |
| No spills or leaks of groundwater from pumps or pipework or storage tanks | Routine inspection of borefield, pipework and storage tanks for evidence of leaks or damage | Monthly | Visual inspection | Monthly | Environmental Checklist |
| Baseline groundwater monitoring of the southern borefield will be undertaken prior to operations phase | Baseline monitoring to be undertaken in accordance with the IWQMP | Prior to commencement of operations | In field sampling in accordance with the IWQMP | Prior to rainfall and post rainfall (to capture potential recharge) | Annual groundwater monitoring report in accordance with IWQMP |
| Baseline groundwater monitoring to be undertaken prior to commencement of treated wastewater irrigation. | A minimum of 1 groundwater monitoring bores to be installed immediately downgradient (within 10 m) of the proposed wastewater irrigation area. | Prior to handover to operations | Visual inspection and coordinates of bore locations(s) recorded | Upon completion of installation of monitoring bore | Bore construction records, including location coordinates |

| | | | | | |
|---|---|---|---|---|---|
| | The irrigation area monitoring bore water quality will be sampled using infield monitoring equipment to determine:<br>• Salinity (measured as electrical conductivity, uS/cm)<br>• pH | Prior to handover to operations | Visual record of EC and pH monitor records | Upon completion of installation of monitoring bore | Groundwater quality records |
| | A sample of groundwater will be collected from the irrigation area monitoring bore by appropriately qualified personnel, and sent to a NATA accredited laboratory for analysis for the following parameters:<br>N NH3<br>N NO2<br>N NO3<br>N NOX<br>N TKN<br>Total Nitrogen<br>Total Phosphorous<br>P total soluble | Prior to handover to operations | Visual inspection of chain of custody forms and laboratory analysis records | Upon receipt of data | Laboratory analytical and chain of custody records |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Groundwater usage exceeds licensed abstraction volume | Incident reported to Construction Contractor Supervisor and Project Manager.<br>Investigation of meter records and groundwater bores, pipework and storage tanks to determine if there are any leaks or damage.<br>Repair or replace equipment as necessary.<br>Report the exceedance to DWER and DCCEEW within 7 days of exceedance being identified and provide follow up incident report, within 21 days of the exceedance occurring.<br>Undertake corrective action associated with trigger and threshold events as described within the IWQMP until DWER/DCCEEW have confirmed in writing that it has been demonstrated that the trigger criteria are being met and the corrective actions are no longer required | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Initial Exceedance report to DWER and DCCEEW<br>Follow up incident report to DWER and DCCEEW which includes:<br>• Details of trigger response actions implemented.<br>• The effectiveness of the response actions implemented against the trigger criteria.<br>• The findings of the investigations.<br>• Measures to prevent the trigger criteria being exceeded in the future;<br>• measures to prevent, control or abate impacts which may have occurred; and<br>• justification of the trigger criteria remaining, or being adjusted based on better understanding, demonstrating that the outcomes will be better met.<br>Annual Groundwater Licence Report |

| | | | | |
|---|---|---|---|---|
| | | | | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |
| Leaks from pipework, or storage tanks observed or reported | Incident reported to Construction Contractor Supervisor.<br>Repair or replace equipment as necessary. | | | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.12 Greenhouse Gas Management

The proposed management measures that will be implemented to manage greenhouse gas emissions, contingency and corrective actions, are described in Table 4-12.

**Table 4-12: Greenhouse Gas Management**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Construction activities will be undertaken to minimise greenhouse gas emissions | All vehicles to be maintained in accordance with manufacturer's recommendations. | Prior to bringing equipment to site | Visual inspection of records | Upon arrival to site | Environmental checklist<br>Vehicle service records |
| | Vehicles and machinery turned off when not in use. | At all times | Visual inspection | Weekly | Environmental checklist |
| | Clearing of native vegetation limited to approved disturbance footprint of 3.98 ha. | During clearing of native vegetation | GPS records maintained of areas cleared | Daily during clearing | Vegetation Clearing Register |
| | All site personnel and visitors to undergo site induction which contains information on minimising vehicle idling. | Prior to entry to site for the first time. | Induction records maintained on site | Weekly review of site records | Training records |

| Contingency and Corrective Actions | | | | |
|---|---|---|---|---|
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** |
| Vehicle service records indicate service overdue | Incident reported to Construction Contractor Supervisor.<br>Undertake servicing of vehicle as soon as practicable. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW |

### 4.1.13 Visual Amenity

Demolition and construction activities will result in temporary changes to the current view from Vlamingh Head Lighthouse, looking towards the existing resort site, for a period of 12 to 18 months. It is acknowledged that the visual integrity of the broader landscape includes the World Heritage listed values *landscapes and seascapes,* with *'stark and spectacular contrast',* as described in UNESCO's Statement of Outstanding Universal Value for the property.

The proposed management measures that will be implemented to minimise and monitor impacts to visual amenity, as viewed from Vlamingh Head Lighthouse or the adjacent coastline; and contingency and corrective actions, are described in Table 4-13.

**Table 4-13: Protection of Visual Amenity**

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| Limit the visual impact of changes to the site by minimising dust emissions and maintaining good housekeeping. | Water based dust suppression measures will be implemented to minimise dust emissions during construction activities, particularly during clearing of native vegetation. | At all times | Visual inspection | Daily, with weekly review | Environmental checklist<br>Vehicle service records |
| | Stabilisation of cleared areas to be undertaken as soon as practicable, which involve mulching or commencement of landscaping activities. | Following completion of clearing | Visual inspection | Weekly | Environmental Checklist |
| | All waste is appropriately contained within designated bins or stockpile areas during construction activities | At all times | Visual inspection | Weekly | Environmental Checklist |
| | Vehicles and equipment access limited to designated roads/access tracks and cleared areas. | At all times | Visual inspection | Daily, with weekly review of site records | Environmental Checklist |
| | Reduced speed limit within the project area (<10 km/hr) | At all times | Visual inspection | Daily, with weekly review of site records | Environmental Checklist |
| | All site personnel and visitors to undergo site induction | Prior to entry to site for the first time. | Induction records maintained on site | Weekly review of site records | Training records |

| Performance Target / Outcomes | Management Actions | Timing of Actions | Monitoring Method | Monitoring Frequency | Records |
|---|---|---|---|---|---|
| | which contains information on minimising dust and other visual impacts. | | | | |
| **Contingency and Corrective Actions** | | | | | |
| **Trigger** | **Corrective Action** | **Responsibility** | **Reporting – Internal** | **Reporting – External** | **Trigger** |
| Excessive dust movement observed moving off site or impacting areas of retained vegetation after implementing dust control measures.<br>Or<br>External complaint | Stop works and investigate the cause of dust movement (severe weather conditions or faulty dust suppression equipment).<br>If weather conditions are the cause of ineffective dust suppression, do not recommence works until weather is favourable<br>If dust suppression equipment is faulty, fix equipment.<br>Only recommence works once dust suppression equipment is effective.<br>If a complaint was received, communicate outcome of investigation and measures taken to reduce dust. | All personnel required to report environmental incidents<br>Construction Contractor Supervisor responsible for internal reporting and investigation<br>Project Manager responsible for external reporting | Incident and complaints register<br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW | Excessive dust movement observed moving off site or impacting areas of retained vegetation after implementing dust control measures.<br>Or<br>External complaint |

# 5. Implementation

Development of the site will be conducted in accordance with this CEMP as a requirement of contractual arrangements within all tenders associated with each stage of the project. It is essential that all personnel associated with the project comply with the requirements of all applicable environmental legislation, regulations, codes of practice and standards. The key roles and responsibility relevant to the implementation of this CEMP are described in Sections 5.1.1 to 5.1.3.

### 5.1.1 Project Manager

The primary responsibilities of the Project Manager (Z1Z Resorts) include:

- Overall compliance with CEMP and relevant approval conditions;
- Act as primary liaison between regulatory authorities (e.g. EPA, Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW)[1], DoD and contractors;
- Engage suitably qualified contractors to implement the CEMP as required;
- Review reports provided by the Environmental Consultant and Construction Contractor as required;
- Maintain appropriate records that demonstrate compliance with the CEMP requirements (to support annual regulatory audits);
- Ensure construction contractors are aware of the requirements of the CEMP; and
- Incident and compliance reporting to relevant regulatory authorities.

### 5.1.2 Construction Contractor Supervisor(s)

The primary responsibilities of each Construction Contractor Supervisor include:

- Comply with the requirements of the CEMP;
- Comply with all conditions of approval, including Shire of Exmouth, Ministerial Conditions (State and Commonwealth)
- Undertake site environmental inspections and monitoring requirements as required by the Project Manager:
- Ensure all site personnel are aware of the requirements of the CEMP and are appropriately inducted;
- Ensure site personnel have appropriate training and qualifications for the work being undertaken;
- Undertake regular inspections to ensure construction workers/ contractors are complying with CEMP measures; and
- Provide relevant records / evidence of compliance with CEMP measures to the Project Manager.

### 5.1.3 All personnel

- Comply with the requirements of the CEMP; and
- Report all incidents immediately to the Construction Contractor Supervisor.

## 5.2 Environmental Training

All site personnel, including contractors and visitors, will undertake a site induction prior to commencing work on the site. The induction will identify the key environmental and social aspects, potential impacts identified in this CEMP and the management and reporting obligations described in Section 4.

[1] Formerly Department of Agriculture, Water and the Environment (DAWE)

### 5.3 Incidents and Emergency Management

In the event of any incident, the priority will be the safety of all site personnel, visitors and the community in the immediate vicinity. Following this, all practical steps will be taken to minimise the risk of environmental damage as soon as possible through the implementation of appropriate incident management or contingency plan procedures.

#### 5.3.1 Environmental Incidents

Environmental incidents include, but are not limited to:

- Clearing outside of the approved disturbance footprint;
- Driving within undisturbed vegetation outside of authorised access tracks or roads within the development envelope, other than for clearing activities;
- Disturbance to known Aboriginal or other Heritage sites;
- Discovery of Aboriginal or other Heritage artefacts or human remains;
- Fauna (including birds) entrapment, injury or death;
- Waste materials stored or disposed of incorrectly;
- Discharges, leaks or spills of sewage, chemicals or fuels;
- Discovery of contaminated soils;
- Contaminated stormwater runoff;
- Bushfires or spot fires occurring on site;
- Erosion resulting from construction activities;
- Non-compliance with approval conditions;
- Non-compliance with Health, Safety and Environment Procedures;
- Exceeding environmental trigger values specified in approval conditions or management plans; and
- Complaints.

Incidents and non-conformances may be raised:

- During inspections and audits;
- Via external complaints or communication;
- When an incident occurs
- After an emergency; and
- When a hazard or procedural non-compliance is observed.

**All environmental incidents must be immediately reported to the Construction Contractor Supervisor, who must notify the Project Manager within 2 hours of the incident occurring where external reporting is required.**

All environmental incidents will be recorded within an Incidents and Complaints Register (Appendix B) along with corrective actions taken to remediate the impact of the incident as appropriate. Contingency actions have been incorporated in this CEMP.

### 5.3.2 Emergency Contacts

The key emergency contacts for environmental emergencies are described in Table 5-1.

**Table 5-1: Emergency Contacts**

| Incident Type | Contact | Contact Details | Additional Information |
|---|---|---|---|
| Death, Injury to Personnel<br>Bushfire<br>Chemical / Fuel spill<br>Discovery of Human Remains | Ambulance / Police / Fire Brigade | 000 | |
| Discharges or emissions that may cause pollution (e.g. chemical/ fuel spills) | Department of Water, Environment and Regulation | 1300 784 782 (24 hours) | unauthorised discharge' report:<br>https://www.der.wa.gov.au/images/documents/your-environment/pollution/Notification_of_waste_discharges.pdf |
| Discovery of Aboriginal Heritage or Remains | Registrar of Aboriginal Sites | 08 6551 8002 (8-4pm WST) | AboriginalHeritage@dplh.wa.gov.au. |
| Wildlife injury | Exmouth Vet | 08 9949 2499 | 5 Krait Street, Exmouth WA |
| | DBCA Wildcare Helpline | 078 9474 9055 (Perth) | https://pws.dbca.wa.gov.au/about-us/contact-us/wildcare-helpline |
| Snakes to be removed | Exmouth snake handler | 0406097526 | |
| Severe weather events and damage | Ambulance / Police / Fire Brigade<br>State Emergency Services | 000<br>132 500<br>Local: 9949 1488 | www.dfes.wa.gov.au |

### 5.3.3 Cyclone Warnings

Cyclone season runs from 1 November to 30 April each year.

In the event of a cyclone warning, refer to the Exmouth cyclone information booklet and Shire Local Emergency Management Arrangements for recommended cyclone preparation:

- https://www.exmouth.wa.gov.au/profiles/exmouth/assets/clientdata/shire_of_exmouth_local_emergency_management_arrangements.pdf
- https://www.exmouth.wa.gov.au/documents/825/tropical-cyclone-book

## 5.4 Monitoring

A monitoring program has been developed to evaluate performance against the targets and contingency triggers identified in Section 4. The monitoring program has been developed to achieve the objectives as listed within Section 4.

## 5.5 Inspections and Audits

The Construction Contractor will undertake at minimum weekly inspections of the work site (unless otherwise specified in this CEMP, e.g., inspections of open trenches at the start and end of each day) to evaluate the effectiveness of environmental controls. These inspections will also take place upon the completion of each stage of construction works.

The results of the inspections will be recorded in the Environmental Inspection Checklist included in Appendix B, and retained for audit purposes. If any maintenance or deficiencies in environmental controls or in the standard of environmental performance are observed, they will be recorded on the checklist form. Records will also include details of any maintenance required, the nature of the deficiency, and any actions required and an implementation priority. The completion of the actions will be monitored to ensure they are implemented within the agreed timeframes.

The Project Manager will ensure an annual audit of compliance with the CEMP is undertaken within the duration of the construction phase of the proposal.

### 5.6 Records

A range of environmental compliance data shall be maintained by the Project Manager, to be used in annual compliance audits, as required by approval conditions. The minimum reporting and records requirements are described in Table 5-2, with additional reporting and records described in the management tables in Section 4.

Reports provided by the contractors may be retained as evidence of legal compliance or non-compliance and must be correct and auditable.

The Project Manager will be responsible for verifying and quality controlling all data reported in relation to site activities.

**Table 5-2: Reporting and Records Requirements**

| Aspect | Information required | Report / Record | External Reporting | Frequency |
|---|---|---|---|---|
| Clearing of native vegetation | • Date of clearing<br>• Extent and location of all clearing performed<br>• Confirmation clearing was conducted within the designated area | Vegetation Clearing Register | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW | Upon completion of clearing activities |
| Earthworks, civil works | Weed hygiene register, including:<br>• Date of vehicle mobilisation to site<br>• Confirmation vehicle is clean and free from a build-up of mud prior to site entry | Weed and Hygiene Inspection Register | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW | Upon mobilisation of equipment/vehicles to site |
| | Daily trench inspection for fauna<br>• Start and end of shift records of any trapped fauna | Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW | Daily |
| All activities | Fauna interactions/injury/death<br>• Details of incident/interaction with fauna and actions taken | Incident and complaints register<br><br>Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW | When event occurs |
| | • Date and time of incident<br>• Nature of the incident<br>• Actions implemented<br>• Confirmation that the incident /complaint was adequately addressed | Incident and complaints register | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW | When event occurs |
| | Compliance with CEMP | Environmental Inspection Form | Annual Compliance Assessment Reporting requirements for EPA and DCCEEW | Weekly |
| | | Compliance Audit | | Annual |

### 5.7 Document Review

This CEMP will be reviewed upon any change to regulatory requirements, conditions of approval or changes to work scope and at least annually for the duration of the construction phase of the proposal. Review of this EMP will include adaptive management actions or procedures to learn from the implementation of mitigation measures.

# 6. Limitations

**Scope of services**

This report ("the report") has been prepared by Strategen-JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen-JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

**Reliance on data**

In preparing the report, Strategen-JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, Strategen-JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Strategen-JBS&G has also not attempted to determine whether any material matter has been omitted from the data. Strategen-JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Strategen-JBS&G. The making of any assumption does not imply that Strategen-JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. Strategen-JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

**Environmental conclusions**

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

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# 7. References


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# Appendix A Whole of Environment Assessment

# EPBC 2020/8693 Ningaloo Lighthouse Resort Project

## Z1Z Resorts Pty Ltd

## Appendix R - Commonwealth Land - Whole of Environment Assessment

**149,628 | 60294**

**7 February 2023**

**We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.**

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.

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# 1. Introduction

Z1Z Resorts Pty Ltd (Z1Z Resorts) is proposing to redevelop the former Ningaloo Lighthouse Caravan Park on Lot 2 and Lot 557 Yardie Creek Road, North West Cape. The proposed redevelopment, the Ningaloo Lighthouse Resort Project (the proposed action), is located approximately 18 km northwest of the town of Exmouth towards the northern tip of the Cape Range Peninsula (Figure 2-1).

The anticipated maximum life of the proposed development is 55 years. It is anticipated that removal of all surface and buried infrastructure, except for heritage listed buildings, will occur within 2 years of cessation of operations.

The proposed action has been referred to the Department of Agriculture, Water and the Environment (now the Department of Climate Change, Energy, the Environment and Water) and has been determined to be a Controlled Action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2020/8693) with the assessment approach being assessment by an accredited assessment process under the Western Australia *Environmental Protection Act 1986* (EP Act).

## 1.1 Description of Proposed Action

The proposed action under the EPBC Act is:

> *To develop the Ningaloo Lighthouse Resort on Lots 2 and 557 Yardie Creek Road, near Exmouth, Western Australia* [EPBC Act referral 2020/8693 as varied by variation request dated 3 June 2021].

The proposed action comprises the construction of new visitor accommodation; the construction of associated ancillary facilities (i.e., staff accommodation, power supply infrastructure, water supply and treatment, wastewater treatment and reuse, and replacement service station (vehicle refuelling) etc.); refurbishment of the Vlamingh Head Lighthouse Quarters (a part of State Heritage Place ID: 00837); and minor works outside of the accommodation areas, including pathways, vehicle access, shades structures and service corridors and enclosures.

The proposed action has been determined to be likely to have a significant impact upon a number of matters of national environmental significance (MNES) under the EPBC Act:

- Listed threatened species and communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A);
- World Heritage properties (sections 12 & 15A);
- National Heritage places (sections 158 & 15C); and
- Commonwealth land (sections 26 & 27A).

## 1.2 Purpose

While the proposed action does not occur on Commonwealth land, Exmouth Gulf hosts numerous equities owned and operated by the Department of Defence. These include the Harold E Holt Naval Communications Station, Space Surveillance Telescope, and Learmonth RAAF Airbase and Solar Observatory. These equities are situated on Commonwealth land in proximity to the proposed action.

This document supports the assessment of impacts to MNES within the Environmental Review Document (ERD) submitted to the WA Environmental Protection Authority (EPA) and the Department of Climate Change, Energy, the Environment and Water (DCCEEW), and as revised following public review.

The information provided in this assessment has been sourced from the environmental impact assessment documentation (ERD and technical appendices), available via the WA EPA website:

(https://www.epa.wa.gov.au/proposed actions/ningaloo-lighthouse-resort-project).

# 2. Environmental Context

The existing Ningaloo Lighthouse Holiday Park, which is the location of the proposed action, is located on freehold land within Lot 2 and Lot 557 Yardie Creek Road the Shire of Exmouth, 1,270 km north of Perth, adjacent to Vlamingh Head on the northern extremity of North West Cape, that has been used for tourism accommodation (caravan park and resort) for over 30 years. The nearest town is Exmouth, approximately 18 km to the south of the proposed action (Figure 2-1).

The proposed action is located approximately 10.7 km from the nearest Defence equity on Commonwealth land, the Naval Communications Station Harold E Holt (NCSHEH), which consists of:

- Area A - very low frequency radio, towers and associated infrastructure located on the tip of North West;
- Area B - high frequency radio towers, C-band radar and capability support facilities located adjacent to the Space Surveillance Telescope;
- Area C, and high frequency receiving station located approximately 55 km south of Exmouth; and
- the Space Surveillance Telescope (SST), approximately 10 km south of the proposed action.

Other defence equities within Exmouth, but not within sufficient proximity for direct or indirect impacts are:

- the Learmonth Solar Observatory, approximately 52.5 km to the south along the Minilya-Exmouth Road; and
- the RAAF Base Learmonth (combined RAAF Air Base/ civilian airport), approximately 54.5 km to the south along the Minilya-Exmouth Road.

The environmental context of the proposed action is described in Sections 2.1 to 2.10 below, and is based on the Australian Government (2013) *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth Agencies, Significant impact guidelines 1.2, Environment Protection and Biodiversity Conservation Act 1999.*

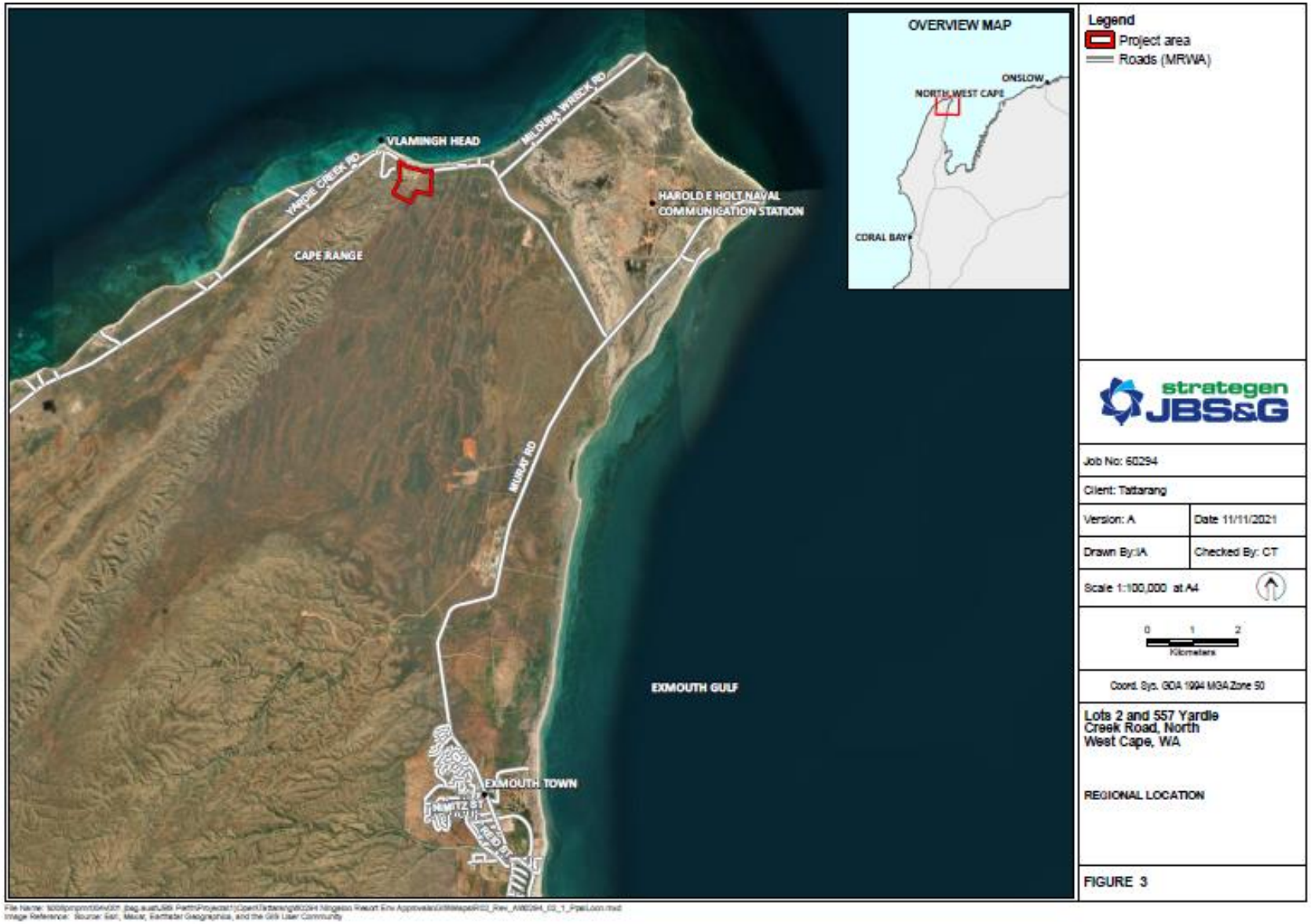


**Figure 2-1: Regional Location**

## 2.1 Landscapes and Landforms

The landscapes and landforms of the environment in which the proposed action is located are described in Table 2-1. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-1: Landscapes and Landforms**

| Landscapes and Landform | Context of Proposed Action |
|---|---|
| What landscape features or landforms are present? | The proposed action (approximately 4m ASL) lies at the western base of Vlamingh Head, which rises to approximately 73m ASL[1], and is part of the Cape Range Peninsula. The Cape Range Peninsula is approximately 96 km in length from north to south and 21 km from east to west, which rises steeply from the coastal plain to approximately 300 m above sea level (ASL) (WRC 1999).<br><br>Landforms in the Cape Range include a high number of caves, rock shelters, sink holes, streams that disappear underground, biokarstic phenomena (such as Ningaloo Reef), protocaves and mesocaverns representative of a karst landscape.<br><br>The interconnected ocean and arid coast of the Ningaloo Coast forms an aesthetically striking landscapes and seascape, which is one of the values of its World Heritage listing. |
| What landscape features or landforms are likely to be directly or indirectly impacted by the action? | **Direct impacts**<br><br>Clearing of up to 3.98 ha of native vegetation surrounding the existing facility.<br><br>Visual change to landscape and the disruption of the scenic quality of Vlamingh Head and the Ningaloo coastline, as a result of the new resort buildings and irrigated landscape.<br><br>**Indirect impacts**<br><br>Abstraction of groundwater and irrigation of treated wastewater may impact on the groundwater habitat values for subterranean fauna. |
| Are there any outstanding, rare, unusual, valuable or important landscape features or landforms? | The karst of the Cape Range Peninsula is unique as relatively few other karst are formed in limestone of such young age (WRC 1999). This karst environment supports subterranean fauna of significant conservation value, for which it is known that the interaction of the freshwater lens overlying brackish and saline quality water is of extreme importance.<br><br>The proposed action lies within terrestrial boundary of the coastal area of the Ningaloo Coast World Heritage Area and within the mapped boundary of the National Heritage Place (Appendix A).<br><br>The integration of the Ningaloo Reef and Exmouth Peninsula karst system as a cohesive limestone structure is at the heart of the natural heritage significance of the Ningaloo Coast.<br><br>The landscapes and seascapes of the World Heritage area are comprised of mostly intact and large-scale marine, coastal and terrestrial environments. The lush and colourful underwater scenery provides a stark and spectacular contrast with the arid and rugged land |

[1] http://members.upnaway.com/~obees/lights/gascoyne/vlamingh.html

## 2.2 Soils and other substrates

The soils and substrates of the environment in which the proposed action is located are described in Table 2-2. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-2 Soils and other substrates**

| Soils and other substrates | Context of Proposed Action |
|---|---|
| What soils or other substrates are present? | Generally, the soils within the proposed development area are shallow soils with underlying rocky and visible rocky outcrops, being sandy limestone soils of the Cape Range with some red Pindan sands, with the following geological units along the seaward portion of the site:<br>• Bundera Calcarenite (Tantabiddi Member, Qbt): Including calcarenite and calcirudite, coralgal reef deposits, shallow marine and minor eolian.<br>• Vlamming Sandstone (Tv): Including well sorted, medium grained crossbedded quartzose calcarenite and calcrete soils and eolian.<br>• Longitudinal and network dunes and residual sand plains (Qe): Including reddish brown to yellowish quartz sand. |
| Is it likely that the soil/substrate will be directly or indirectly impacted by the action? | **Direct impacts**<br>Earthworks and minor excavations (e.g. trenching for electrical and plumbing infrastructure) are required. There is potential for erosions of soils during construction activities resulting from wind and stormwater.<br>**Indirect impacts**<br>There is potential for soil contamination from unplanned fuel, chemical or wastewater spills |
| Is the soil/substrate valuable, or does it contain objects that are rare or otherwise valuable?<br>For example: archaeological items with heritage value. | The Cape Range Peninsula is an archaeologically rich region resulting from a long history of occupation by Aboriginal people for over to 35,000 years. The Cape Range Peninsula is an archaeologically rich region resulting from a long history of occupation by Aboriginal people for over to 35,000 years. Evidence of their continual occupation has been found within the range from caves and midden sites on the shoreline between Mangrove Bay and Yardie Creek (Meissner 2010).<br>The dune sand systems within and adjacent to the proposed action development envelope have been identified as having potential for Aboriginal cultural artefacts and/or burial sites. |
| Is the soil susceptible to impacts or will disturbance of the soil cause further impacts?<br>• Are there steep slopes?<br>• Is there evidence of previous erosion?<br>• Is the soil/substrate friable (easily eroded)?<br>• Are acid sulphate soils present? | The site has some undulation and elevated locations, with existing buildings (to be replaced). Minimal alteration to the natural topography is required.<br>There is some evidence of erosion within the existing drainage lines due to the rapid runoff experienced during rainfall events.<br>There are no acid sulphate soils known to be present. |

## 2.3 Water

The water values and characteristics within the area in which the proposed action is located are described in Table 2-3. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-3: Water**

| Water | Context of Proposed Action |
|---|---|
| What are the characteristics of the catchment area and what water bodies are present?<br>• What water catchment area will the action be located in and what geographic area does the water catchment cover?<br>• What water bodies are present (for example, rivers, creeks, lakes groundwater, wetlands, estuaries and the ocean)? | The proposed action development envelope is located within a semi-arid climate, being hot and dry for much of the year within. The region is characterised by dry winters and sporadic and variable summer rainfall, resulting from tropical cyclone activity, with low average annual rainfall (200-400 mm) falling mostly in bursts on intense rainfall over summer (December-March) (DWER 2021a).<br>**Surface water**<br>There are no surface wetlands or watercourses present within the vicinity of the proposed action area. The existing natural drainage at the site occurs via a large central swale which captures most of the water from the high areas of the site to the south and west, and naturally flows towards the dunes on the other side of Yardie Creek Road.<br>**Groundwater**<br>The proposed action is located within the Exmouth Groundwater Subarea, which comprises both unconfined and confined aquifers (WRC 1999). The Exmouth Groundwater Subarea is a subarea of the Gascoyne Groundwater Area, a proclaimed groundwater area under section 26 of the *Rights in Water and Irrigation Act 1914* (WA) (RIWI Act).<br>The proposed action is also located within the mapped area of the of the Cape Range Subterranean Waterways wetland, listed in the Directory of Important Wetlands of Australia. The low-lying portions of the survey area includes buffers for the Cape Range Subterranean Waterways wetland, which is located approximately 2.5 km east of the proposed action area. Other areas included in the wetland are scattered through Northwest Cape. These consist of waterways, sinkholes, general groundwater and artificial wells, with the main ecological feature being entirely endemic stygofauna. |
| Is it likely that any water bodies will be directly or indirectly impacted by the action?<br>• Does the action involve impoundment, diversion, or extraction of water?<br>• Will the action alter drainage patterns?<br>• Will the action create or increase pollutants, nutrients, or sediment? | The proposed action requires increased abstraction of groundwater for potable water supply (which requires treatment via reverse osmosis).<br>No changes to the drainage patterns within the site are proposed. The resort design is intended to utilise existing drainage lines which includes the central swale which drains towards the coast.<br>Site activities, such as earthworks for construction; unplanned fuel, chemical or waste spills (e.g. from vehicle movements, sewage collection and treatment); nutrients from treated wastewater irrigation may impact on surface water runoff during rain events and/or groundwater via infiltration. |
| Will any sensitive, valuable or otherwise important water bodies be impacted?<br>For example, wetlands or other sensitive environments and | Groundwater abstraction will occur from within the mapped boundary of the Cape Range Subterranean Waterways wetland. The new borefields outside the development envelope are designed to draw from the brackish zone of the aquifer. The bores within the site boundary on Lot 2, near the coast, are designed to draw saline water from depth (approx..40 m below ground level). |

| Water | Context of Proposed Action |
|---|---|
| drinking water supplies. | Treated wastewater may infiltrate groundwater following irrigation of landscaped areas. |
| What is the condition and current use of water bodies which may be impacted?<br>• What is the water quality?<br>• Are there competing uses? | Baseline water quality monitoring has been undertaken and is indicated in Table 2-4.<br>Nitrate (NO3-N) nears total nitrogen (TN) in all bores except for monitoring bore LH02M.The results show that the distribution of groundwater nitrate (NO3-N) across both borefields is consistent with groundwater nitrate levels reported elsewhere on the Exmouth Peninsula Bennelongia (2018, 2020) returning nitrate (NO3-N) between 0.07 to 3.1 mg/L, with a median level of 1.4 mg/L . Site LH08P had a very high nitrate level of 11 mg/L. This bore was in the vicinity of effluent evaporation ponds in the new borefield. The high result may indicate that there was historical leakage these ponds. However, bore LH10P had a reading of 0.55 mg/L (Pennington Scott 2021b).<br>Groundwater phosphate levels are generally low throughout the region, being in the range of 0.01 mg/L to 0.04 mg/L (PO4-P). There does not appear to be any apparent increase of phosphate around the Resort, suggesting strong plant uptake and soil absorption of phosphates (Pennington Scott 2021b).<br>The location of regional bores is provided in **Error! Reference source not found.**. The hydrogeological assessment (Pennington Scott 2021a) projected the maximum drawdown (over the high season) is likely to cause a maximum discernible drawdown impact extending up to 370 m from the new southern borefield, with the highest drawdown in each production bore ranging from 0.4 m to 0.6 m.<br>There are no third-party bores within the projected drawdown impact area around the borefield. The closest registered bore for general water usage is greater than 5.5 km from the proposed action borefield (registered as a stock and domestic bore) and the closet borefield for water supply is the Department of Defence borefield, located more than 6 km from the proposed action. The new southern borefield will have no impact on these bores. |

**Table 2-4: Baseline groundwater quality results (Pennington Scott 2021b)**

| | | | New Borefield | | | | | | | | | Old Borefield | | | | Stat Summary | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BH01M | BH02M | BH04P | BH06P | BH07P | BH08P | BH09P | BH10P | BH11P | Bore B | Bore D | New Bore 2 | New Bore 3 | Average | Median | Min. | Max. |
| | | | 15/8/21 | 15/8/21 | 14/8/21 | 13/8/21 | 14/8/21 | 13/8/21 | 13/8/21 | 13/8/21 | 14/8/21 | 11/8/21 | 12/8/21 | 6/8/21 | 8/8/21 | | | | |
| Hydrogen sulphide | H2S | mg/L | <0.01 | <0.01 | <0.01 | 0.08 | <0.01 | 0.04 | <0.01 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.05 | 0.04 | 0.04 | 0.08 |
| | Sulphide | mg/L | <0.01 | <0.01 | <0.01 | 0.08 | <0.01 | 0.03 | <0.01 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.05 | 0.04 | 0.03 | 0.08 |
| Nitrogen | N_NH3 | mg/L | 0.011 | 0.018 | 0.071 | 0.035 | 0.12 | 0.01 | 0.087 | <0.010 | 0.036 | <0.010 | <0.010 | <0.010 | <0.010 | 0.05 | 0.04 | 0.01 | 0.12 |
| | N_NO2 | mg/L | 0.031 | <0.010 | <0.010 | <0.010 | <0.010 | 0.022 | 0.022 | 0.01 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | 0.02 | 0.02 | 0.01 | 0.03 |
| | N_NO3 | mg/L | 1.1 | 1.3 | 0.21 | 0.38 | 0.07 | 11 | 0.47 | 2 | 0.44 | 1.4 | 2 | 3.1 | 2.6 | 2.01 | 1.30 | 0.07 | 11.00 |
| | N_NOx | mg/L | 1.1 | 1.3 | 0.21 | 0.38 | 0.067 | 11 | 0.49 | 2 | 0.44 | 1.4 | 2 | 3.1 | 2.6 | 2.01 | 1.30 | 0.07 | 11.00 |
| | N_TK | mg/L | 0.14 | 1.6 | 0.12 | 0.13 | 0.19 | <0.025 | 0.087 | <0.025 | 0.036 | 0.028 | 0.026 | <0.025 | <0.025 | 0.26 | 0.12 | 0.03 | 1.60 |
| | N_total | mg/L | 1.2 | 2.9 | 0.33 | 0.51 | 0.26 | 11 | 0.55 | 2 | 0.44 | 1.4 | 2 | 3.1 | 2.6 | 2.18 | 1.40 | 0.26 | 11.00 |
| Phosphorus | P_SR | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | - | - | 0.00 | 0.00 |
| | P_total | mg/L | 0.022 | 0.14 | 0.014 | 0.006 | 0.006 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.04 | 0.01 | 0.01 | 0.14 |
| | P_totsol | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | - | - | 0.00 | 0.00 |
| Biological $O_2$ Demand | BOD | mg/L | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | 0.00 | 0.00 |


**Figure 2-2: Regional groundwater bores**

## 2.4 Vegetation

The vegetation within the area in which the proposed action is located are described in Table 2-5. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-5: Vegetation**

| Vegetation | Context of Proposed Action |
|---|---|
| What general vegetation types and vegetation species are present?<br>• Vegetation types: rainforest; forest; woodlands; grasslands; riparian (river side) vegetation; mallee vegetation; sub-alpine heath; coastal heath; mangroves.<br>• Vegetation species: tree species; shrub species; grass species; marine plants.<br>• Are any ecological communities present? | The proposed action occurs within the Carnarvon Botanical District of the Eremaean Province which is characterised by Acacia scrub and low woodland moving to tree and shrub steppe in the north (Beard 1990).<br><br>Seven vegetation types have been identified and recorded from within the flora and vegetation survey area, of which four occur within the proposed action area (Ecoscape 2018):<br><br>• **AcRP shrubland** (*Acacia coriacea* and *Rhagodia preissi*i shrubland)<br>This vegetation type was observed to occur commonly on the northern and western shores of the North West Cape Peninsula outside the survey area. Similar vegetation is considered to be widespread and has been reported from near Learmonth, adjacent to Exmouth, near the entrance to the Cape Range National Park, and along the coast to the west of Cape Range (Ecoscape 2108). This recorded vegetation type and the adjacent TeSlWa grassland, do not have any conservation significance, nor are they considered to have any regional or local significance, and both are represented within the conservation estate in Jurabi Coastal Park and Cape Range National Park.<br>• **Mc shrubland** (*Melaleuca cardiophylla* shrubland)<br>This is the most commonly occurring vegetation type within the survey area and Development Envelope. Similar vegetation is considered to be widespread and has been reported within Cape Range. None of the recorded vegetation types of the Limestone Hills of Cape Range have any formal conservation significance, and although endemic to the Cape Range, are considered to be widespread within and adjacent to the Range that extends for approximately 80 km to the south. These vegetation types are represented within the conservation estate in the Cape Range National Park<br>• **Ab shrubland** (*Acacia bivenosa* shrubland)<br>This vegetation type is a somewhat species-poor version of Mc shrubland and, while of restricted extent due to its association with landforms that are restricted in extent, it is considered widespread within Cape Range. None of the recorded vegetation types of the Limestone Hills of Cape Range have any formal conservation significance, and although endemic to the Cape Range, are considered twidespread within and adjacent to the Range that extends for approximately 80 km to the south. These vegetation types are represented within the conservation estate in the Cape Range National Park<br>• **BaDp shrubland** (*Banksia ashbyi* and *Daviesia pleurophylla* shrubland)<br>This was the single vegetation type recorded from the red Pindan dunes and is substantially similar to described vegetation from the same area in other documents (Keighery & Gibson 1993; Meissner 2010a; 2010b; Pringle 1987 in Ecoscape 2018). Although this vegetation type does not have any formal conservation significance, all previous surveys that have included this landform and the vegetation upon it have considered the |

| Vegetation | Context of Proposed Action |
|---|---|
| | vegetation to be of significance for various reasons including it being confined to a restricted landform or having unique floristic composition. In particular, earlier survey (Miessner 2010b in Ecoscape 2018) contend that while red sand dunes occur to the south of the survey area, the northern dunes where this vegetation type was recorded have a different floristic composition to the southern dunes and are represented by small (approximately 50 ha) area within the Jurabi Coastal Park. These northern dunes are otherwise not protected corresponding within Unallocated Crown Land (UCL). It may also be significant as habitat for *Daviesia pleurophylla (*P2). In conclusion, this vegetation type is considered locally and potentially regionally significant.<br><br>None of the existing vegetation has any formal conservation significance i.e., none is representative of any currently described Threatened Ecological Community (TEC) or Priority Ecological Community (PEC).<br><br>A total of 169 vascular flora species were recorded from within the survey area from floristic quadrats, releves and opportunistic observations (Ecoscape 2018). Eight (4.76%) were introduced species. The families with the highest number of taxa were Poaceae (23 taxa), Fabaceae (22), Malvaceae (14) and Asteraceae and Myrtaceae (seven each). The most commonly recorded genera were *Acacia* (nine taxa), *Triodia* (five taxa) and *Ptilotus* and *Scaevola* (four taxa each). The most commonly encountered species were *Solanum lasiophyllum*, recorded from 15 of 19 quadrats and releves, and **Cenchrus ciliaris* (Buffel Grass), from 12 of 19 quadrats and releves.<br><br>No EPBC Act-listed or WC Act-listed Threatened Flora were recorded in the survey area.<br><br>A Targeted Survey (Strategen-JBSG 2021) was conducted over the entire proposed impact area to target the conservation significant species. The survey recorded seven State listed Priority flora species, with one taxa (*Stackhousia umbellata*) present within the proposed Impact area. |
| Is it likely that vegetation will be directly or indirectly impacted by the action? | **Direct impacts**<br><br>The proposed action requires the clearing of up to 3.98 ha of native vegetation within the development envelope, which provided fauna habitat for MNES species (in particular the Black-flanked rock wallaby).<br><br>**Indirect impacts - Fragmentation**<br><br>Fragmentation is unlikely to be significant as a result of the proposed action as the area, in general, forms contiguous habitat (both in terms of flora and fauna habitat) and this is unlikely to change in the future.<br><br>**Indirect impacts – Weeds**<br><br>Increased abundance and/or diversity of weeds within native vegetation can indirectly result in degradation and decline in vegetation condition. Eight introduced species were recorded from the survey area and are described further in this table below.<br><br>.<br><br>**Indirect impacts - Changes to fire regimes**<br><br>As part of the bushfire risk assessment, whilst the historical evidence indicates a bushfire outside of the development is possible, it was noted that the |

| Vegetation | Context of Proposed Action |
|---|---|
| | likelihood of bushfire within or around the proposed action area, is not considered a likely occurrence. The proposed action is unlikely to alter the frequency, intensity or extent of fires. |
| Are there any vegetation types or associations that are rare, endemic or otherwise valuable?<br>• For example, listed threatened plant species and ecological communities; habitat for listed threatened animal species or ecological communities. | None of the existing vegetation has any formal conservation significance i.e., none is representative of any currently described Threatened Ecological Community (TEC) or Priority Ecological Community (PEC).<br>However, the vascular flora of the area is known to have both southern, temperate and eremaean, arid and semi-arid, affinities, and many species from either of these zones are at either the northern (for southern species) or southern (for eremaean species) end of their natural range. Geographically, all species are at the western extent of their distribution due to the survey area location. Physical characteristics of many species, including attributes such as leaf size and shape, and the amount of hairiness of some species, were also at the extremes of their recorded physiological ranges.<br>No EPBC Act-listed or WC Act-listed Threatened Flora were recorded in the survey area.<br>The vegetation supports at least three terrestrial fauna habitats, which may support *Petrogale lateralis* (Black-flanked Rock-wallaby) which is listed as Endangered under the EPBC Act and *Biodiversity Conservation Act 2016* (WA) (BC Act). It is now restricted to disjunct populations, including those of Cape Range National Park. Cape Range population estimates are approximately (200-250) (Australia Government Department of Parks and Wildlife 2013). Within Cape Range this species has a very small area of occupancy and is severely fragmented with mostly small, isolated subpopulations. The Black-flanked Rock-wallaby inhabits rocky areas, caves, cliffs, screes and rock piles, where they shelter during the daytime. At dusk they emerge to feed on grasses, shrubs and occasionally seeds and fruits (Woinarski et al. 2012). |
| What is the condition and current use of the vegetation?<br>• Is the vegetation remnant vegetation or regrowth?<br>• Does the vegetation contain weed species? How many? | The native vegetation surveyed for the proposed action is undisturbed vegetation. The condition of the vegetation of the survey area (Ecoscape 2018) ranged from Excellent condition to Degraded condition, with the better condition vegetation (Very Good and Excellent) associated with the limestone soils of the Cape Range and the red Pindan dunes east and south of the existing Holiday Park. Areas close to the roads, Holiday Park, powerline, along the sewerage line to the settling ponds to the south, and on the coastal side of Yardie Creek Road were in lesser condition, generally rated as such due to the amount of Buffel Grass (**Cenchrus ciliaris*) in these areas.<br>Eight introduced flora species (weeds), representing 4.76% of the total flora species, were recorded during the field survey (Ecoscape 2018). Buffel Grass (**Cenchrus ciliaris*) was the most commonly recorded introduced species occurring in 12 of 19 quadrats and relevés, and was a major contributor to vegetation condition assessment of Very Good being the highest (best) vegetation condition score recorded for all areas near the Holiday Park and near roads and other infrastructure. Buffel Grass (**Cenchrus ciliaris*), introduced as a pastoral species, is significantly affecting the vegetation condition in parts of the survey area, particularly on sandy soils and adjacent to human development including roads. Clearing, especially on sandy soils, potentially provides additional habitat for this species.<br>One Declared Pest plant and WONS species was recorded during the Ecoscape 2018 survey; a single **Tamarix aphylla* clump (most likely a single, large plant, |

| Vegetation | Context of Proposed Action |
|---|---|
| | Plate 1) was recorded on the beach north of the Caravan Park. *Tamarix aphylla* (Athel Tree, Tamarix, Salt Cedar) is a listed weed species (and Declared Pest plant) is frequently planted as a shade tree in arid and semi-arid areas, including at the Lighthouse Caravan Park (Ecoscape 2018). Although this species is potentially invasive, and the individual is unlikely to have been deliberately planted, invasion by this species does not overall appear to have occurred, however, may potentially occur in the future.<br><br>Kapok Bush (**Aerva javanica*) was observed along all road verges throughout the survey area, however the only uncleared areas where this species was recorded was adjacent to the sewerage pipe between the Caravan Park and the sewage settling ponds to the south, and on the scree slopes between the Vlamingh Head Lighthouse and Yardie Creek Road. This species has the potential to invade any cleared area.<br><br>Stinking Passion Flower (**Passiflora foetida*) was observed in only one minor gorge within the survey area, although it has potential to invade other areas. |

## 2.5 Animal Species

The animal species within the area in which the proposed action is located are described in Table 2-6. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-6: Animal species**

| Animal species | Context of Proposed Action |
|---|---|
| What animal species are present and what are their characteristics?<br><br>• Terrestrial species/marine species/ecological communities?<br>• Populations, movements, and breeding, feeding, and migration patterns/times | **Terrestrial species**<br>A desktop assessment and Level 1 survey of the proposed action was undertaken by Ecoscape during 9-14 July 2018, in accordance with the EPA's *Technical Guidance – Terrestrial Fauna Surveys* (EPA 2016b). Forty-six vertebrate fauna species, listed in Table 2-7, were recorded during the field survey from opportunistic observations, during targeted searches, motion camera records and secondary signs. The species consist of six mammals (three introduced), 28 birds and 12 reptiles (Ecoscape 2018).<br><br>Of the six mammals recorded (Ecoscape 2018), none were of conservation significance and three were introduced (cat, rabbit, sheep). The native species were Euro (*Osphranter robustus*) and Echidna (*Tachyglossus aculeatus*), both of which are common, frequently encountered, highly visible and wide-ranging and not requiring specific habitat types, and *Pseudantechinus roryi*, which was recorded on motion camera in a minor cave to the east of the Vlamingh Head Lighthouse. This small carnivorous marsupial is not of conservation significance and has a range extending from the North West Cape Peninsula, which is a disjunct population, through the Pilbara, Great Sandy Desert, Little Sandy Desert, Gibson Desert and Great Victoria Desert bioregions. consider The Cape Range population may represent an undescribed taxon (Menkhorst & Knight 2011 in Ecoscape 2018). For this reason, this species may be considered as significant (EPA 2016d).<br><br>Twelve reptiles were recorded during the field survey, only one of which was of conservation significance: *Lerista allochira* (Cape Range Slider, P3). This species is known only from the North West Cape Peninsula, inhabiting a |

| Animal species | Context of Proposed Action |
|---|---|
| | known range of approximately 70 km north-south and 20 km east-west. All habitat types provided suitable areas for various reptile species.<br><br>The suite of reptiles, and the number of individuals observed during the field survey was considered by Ecoscape (2018) to be low compared to what was expected given the weather conditions and season of survey. It is possible that the extremely hot and dry summer (Section 5.1.3.1) may have affected reptile populations, and residual populations may have been lower than usual.<br><br>Twenty-eight bird species were recorded. Only one, the Osprey (*Pandion haliaetus*), was of conservation significance is listed for protection under international agreements, however, is frequently recorded in mostly coastal areas all over Australia, and also in Sulawesi, Java, New Guinea and New Caledonia (Atlas of Living Australia 2018). No other species of conservation significance were recorded, and all recorded birds are considered as commonly occurring. All habitat types were utilised by various species.<br><br>**Short range endemic invertebrates**<br><br>The Exmouth Peninsula is considered likely to contain high richness of SRE invertebrates. These are mostly ground-dwelling invertebrates that have overall ranges of less than 10,000 km$^2$ (Bennelongia 2021a). This makes them susceptible to spatially extensive habitat changes, especially if anthropogenic.<br><br>This desktop assessment (Bennelongia 20201a)indicates that there is a community of potential SRE invertebrates (11 species) with a likelihood of occurring within the area ranging from moderate to high. The species include trapdoor spiders, pseudoscorpions, harvestmen, scorpions, millipedes, isopods, and snails. Six species of confirmed SREs were recorded in the search area, but only three of these are likely to occur in the proposed action development envelope:<br>• Land snail: *Promonturconchum superbum*<br>• Millipede: *Boreohesperus capensis*<br>• Millipede: *Antichiropus humphreysi*<br><br>The Bennelongia March 2021 field survey targeted seven SRE Groups: spiders (Araneae), pseudoscorpions (Pseudoscorpiones), scorpions (Scorpiones), centipedes (Chilopoda), millipedes (Diplopoda), slaters (Isopoda) and snails (Gastropoda). Even though earthworms (Oligochaeta) and velvet worms (Onychophora) are known to contain SREs, these groups were not targeted as they are restricted to high-rainfall areas (Blakemore 2000; Reid 2002 in Bennelongia 2021a).<br><br>The survey documented 38 species belonging to SRE including two species of mygalomorph spider; one species of 'flattie' spider Selenopidae); 9 species of pseudoscorpion; five species of scorpion; three species of centipede, five species of millipede; one species of dipluran; six species of slater and six species of land snail. Out of these species, 16 were potential SREs, two were confirmed SREs (the millipedes *Antichiropus humphreysi* and *Boreohesperus capensis*), and the remaining 20 species were unlikely SREs or widespread species. Only the pseudoscorpion *Austrohorus* `BPS342` and the scorpion *Lychas* 'BSCO065' are potential SREs currently only known from the proposed action development envelope and, therefore, of conservation significance. These two species are potential SREs because of deficient data and further studies might align them genetically with species outside the proposed action area.<br><br>**Subterranean Fauna** |

| Animal species | Context of Proposed Action |
|---|---|
| | The proposed action overlies the Cape Range Subterranean Waterways. This subterranean system occupies the entire coastal plain and lower foothills of the Cape Range Peninsula and extends inland at the base of the Peninsula from Norwegian Bay on the west coast to Bay of Rest on Exmouth Gulf (Humphreys, 2000). A closely related system in found on Barrow Island. The Cape Range Subterranean Waterways is listed as a wetland of national importance (WA006), principally for its subterranean fauna (EPA 2021; Humphreys 2000). The majority of the records are of endemic subterranean fauna located specifically in the caves of the karst system, developed in the Tulki and Trealla Limestones. The cave system is primarily on the crest of the range and supports the locally endemic troglobitic cave fauna. The stygofauna are primarily within the coastal plain system within the Tulki Limestone. No karst was identified within the proposed action Development Envelope or borefield. There is diversity within the WA006 system itself across the Peninsula. As such, the result is a variety of habitats with corresponding different subterranean communities.<br><br>The presence of subterranean fauna is strongly linked to geology and hydrology and the availability of suitable micro-habitats. The geological formations that support subterranean fauna have suitable pores, voids, fractures, and cavities. These provide an interconnect space for the presence of air (for troglofauna) or water (for stygofauna). Hydrologically, subterranean species have similar requirements to surface water species with hypersaline waters having lower diversity. Aquifers that have shallow surface water levels support a more diverse stygal community reflecting higher dissolved oxygen levels and nutrient transfer, such as calcretes. High transmissivity yields a greater stygal diversity.<br><br>Bennelongia was engaged to undertake a desktop assessment (2020) and subsequent field sampling program (2021).The desktop assessment (Bennelongia 2020) found that the Exmouth Peninsula supports at least two native stygal fish species and 69 species of invertebrate stygofauna (Bennelongia 2020) .<br><br>The two fish species are the blind gudgeon (*Milyeringa veritas)* and the blind cave eel (*Ophisternon candidum*) which are listed as Vulnerable species under the BC Act and the Commonwealth EPBC Act. The blind gudgeon is restricted to Exmouth Peninsula (Larson et al. 2013 in Bennelongia 2021b) but the blind cave eel also extends into the Pilbara (Moore et al. 2018 in Bennelongia 2021b).<br><br>Nine listed species, eight threatened and one priority species (an informal state listing) of invertebrate stygofauna occur on the Peninsula. Seven of the species occur at Bundera Sinkhole on the western side of Cape Range Peninsula (whereas the proposed action is located on the eastern side) and are listed as Critically Endangered or, in one case, Endangered under the BC Act. Only one of them, the remipede *Kumonga exleyi*, is listed (as Vulnerable) under the Commonwealth EPBC Act. The two species outside Bundera Sinkhole are the shrimps *Stygiocaris lancifera* and *S. stylifera*, which occur on the western and eastern coastal plains, respectively. *Stygiocaris lancifera* is listed as Vulnerable under the BC Act and *S. stylifera* is listed as a Priority 4 species.<br><br>Based on the desktop assessment, the likelihood of troglofauna habitat within the borefield and the proposed action area was very low. Additionally, the potential impacts from implementation of the proposed action to potential troglofauna habitat is also considered low. Activities do not include removal |

| Animal species | Context of Proposed Action |
|---|---|
| | of habitat. As such, the focus of the sampling program was on stygofauna with no dedicated troglofauna sampling undertaken.<br><br>The proposed action borefield and bores outside of the proposed development envelope (regional bores) were surveyed. Forty stygofauna samples were collected from two rounds of survey. Thirty samples were taken from 17 bores within the borefield and 10 samples were collected from nine 'regional' bores outside the borefield in the northern part of the Peninsula (Figure 2-2).<br><br>A total of 477 specimens of at least 13 stygal taxa were collected (Table 2-8). The borefield yielded 41 specimens from 30 samples (17 bores) while 10 regional bores yielded 436 specimens. Only four taxa could be identified to species level. The other seven specimens could not be identified to species level. This is not uncommon for stygofauna given the status of taxonomic resolution. The taxa were characteristic of subterranean communities in the Pilbara, dominated by crustaceans.<br><br>The nearest known occurrence of the listed blind cave eel is about 1.3 km north of the new borefield near the coast. The listed blind gudgeon has been collected about 3.5 km west of the southern end of the new borefield. As with the eel, it can be inferred the blind gudgeon occurs along the coast in the vicinity of the proposed action. Neither species was detected during survey. Existing records suggest that occurrence of either the blind cave eel or blind gudgeon immediately east of Cape Range in the new borefield is unlikely, given that the distribution of both species is coastal (Bennelongia 2021). Furthermore, bore logs for both the new southern borefield and the deep salt water bores on Lot 2, indicate the aquifer material, is unlikely to provide suitable habitat for these fish species.<br><br>In contrast to the rich stygofauna community found more generally on the Peninsula, the new borefield appears to contain a depauperate stygofauna despite quite intensive sampling. It contains probably four species of stygofauna compared with 77 now known from the Peninsula, although there was greater taxonomic effort applied to the borefield survey than across most surveyed parts of the Peninsula. The other 11 species collected during the survey were in areas outside the borefield.<br><br>Thirty species were collected in a similar-sized survey at Exmouth with similar taxonomic effort to that of the borefield survey. The crustacean species that characterise the stygofauna of the Peninsula and support most taxonomic interest are largely absent from the borefield.<br><br>Of the taxa yielded, the copepod *Parastenocaris* and the oligochaete, Enchytraeidae `3 bundle` s.l. (short sclero), were only collected from the borefield. The other taxa collected in the borefield – a nematode, and the copepod *Diacyclops humphreysi*, were also collected from regional bores which are outside of Development Envelope.<br><br>The low number of stygofauna species in the borefield is probably the result of the watertable in the borefield being deep (30-50 mbgl) and the borefield aquifer being in Tulki limestone that consists mostly of weakly cemented sand, rather than containing caverns (Bennelongia 2020).<br><br>The current state of taxonomic resolution for subterranean fauna, including available DNA metadata, it is not uncommon for stygal taxa to remain unresolved. However, dispersal capability is evident from the distribution of the stygal groups in the aquifer and therefore they are considered not at risk |

| Animal species | Context of Proposed Action |
|---|---|
| | from implementation of the proposed action.<br><br>**Seabirds and Shorebirds**<br><br>Pendoley Environmental (Pendoley 2022a) were engaged by the Proponent to conduct a desktop assessment to identify the seabirds and migratory shorebirds that are likely to use the proposed action site and adjacent beach habitat and identify the potential Impacts of lighting to migratory shorebirds/seabirds if present.<br><br>The North West Cape provides ecologically important feeding, roosting and breeding habitat for many species of resident and migratory seabirds, shorebirds and marine raptors. Marine birds can be categorised as resident (primarily remain in the region during breeding and non-breeding activities) or migratory/dispersive (present in the region for only part of its breeding/non-breeding cycle).<br><br>Migratory species are present in the area annually during predictable seasons. The exception to this includes international migratory species that may remain in the region during the austral winter, returning to their northern hemisphere breeding ground biannually; separate meta populations within a species with a resident cohort that remain in the region breeding in the austral winter; migratory cohort occur in the region during the austral winter after having bred further south during the austral summer; as well as migratory species that breed in the region during the austral summer that may remain during the austral winter instead of dispersing to their non-breeding grounds closer to the equator (Pendoley 2022a).<br><br>The terrestrial areas situated within 6 km and marine areas situated within 20 km of the proposed action site provide habitat for:<br><br>• resident and migratory seabirds, including species of terns, noddies, cormorants and shearwaters; and<br>• resident and migratory shorebirds. Resident species include plovers, curlews, egrets and oystercatchers. Migratory species pass through the region in the austral summer, which is part of the East Asian-Australasian Flyway (Bamford et al. 2008 in Pendoley 2022a), on their way to northern Australia, from breeding grounds in the Northern Hemisphere or wintering grounds in New Guinea. Migratory shorebird species include plovers, sandpipers, stints, curlews, knots and godwits (Pendoley 2022a).<br><br>Fifty one shorebird species have been recorded along the Ningaloo coastline in the proposed action region (Pendoley 2022a). The families that represented the main species were the sandpipers (*Scolopacidae*; 23 species), plovers (*Charadriidae*; 12 species), pratincoles (*Glareolidae*; 10 species) and herons (*Ardeidae*: 6 species). The most abundant species in the study area were the grey-tailed tattler, red-necked stint (*Calidris ruficollis*), bar-tailed godwit and the greater sand plover (*Charadrius leschenaultia*). Higher numbers of migratory shorebirds were recorded along the Ningaloo coast in the proposed action region and surrounds during the austral summer (Surman & Nicholson 2015, Bamford et al. 2008 in Pendoley 2022a).<br><br>The database searches for marine birds recorded within the proposed action region (terrestrial areas within a 6 km radius - nominally between the resort and the Mildura Wreck to the north-east, and Wobiri to the south west) as well as those that occur within a 20 km of the proposed action region at sea, |

| Animal species | Context of Proposed Action |
|---|---|
| | identified the following:<br>• Ten EPBC listed species of seabird, two listed marine raptor species and 11 listed species of shorebird; and<br>• 18 species of seabird, three marine raptor species and 30 species of shorebird protected by State legislation (BC Act), listed in Table 2-9.<br>The species identified include migratory and resident seabirds, shorebirds and marine raptors that occur at sea nocturnally, and would not normally occur within the proposed action region, as they can be attracted to bright lights from a distance of 20 km. Of the species identified, those observed during the Ecoscape (2018) field survey are listed in Table 2-9.<br><br>**Marine Fauna – marine turtles**<br><br>Of the seven species of marine turtles in the world, six occur in Australian waters and all of these occur in the waters of the Ningaloo Coast. All are Threatened species, protected under both Commonwealth (EPBC Act) and WA (*Biodiversity Conservation Act 2016*) legislation:<br><br>• Flatback turtle (*Natator depressus*), Vulnerable (EPBC Act, BC Act)<br>• Green turtle (*Chelonia mydas*), Vulnerable (EPBC Act, BC Act)<br>• Hawksbill turtle (*Eretmochelys imbricata*), Vulnerable (EPBC Act, BC Act)<br>• Leatherback turtle (*Dermochelys coriacea*), Endangered (EPBC Act), Vulnerable (BC Act)<br>• Loggerhead turtle (*Caretta caretta*), Endangered (EPBC Act, BC Act)<br>• Olive Ridley turtle (*Lepidochelys olivacea*), Endangered (EPBC Act, BC Act)<br>There are only a few large nesting populations of the green, hawksbill and loggerhead turtles left in the world. Australia has some of the largest marine turtle nesting areas in the Indo-Pacific region and has the only nesting populations of the flatback turtle.<br>Marine turtles are known to utilise onshore and offshore areas of habitat situated within 20 km of the proposed action. Of the turtles found in Western Australian waters, three nest on mainland beaches and islands of Ningaloo Reef over the summer months, from November to March (Ningalooturtles.org.au, 2021):<br>• Loggerhead turtle (*Caretta caretta*), Endangered (EPBC Act, BC Act)<br>• Green turtle (*Chelonia mydas*), Vulnerable (EPBC Act, BC Act)<br>• Hawksbill turtle (*Eretmochelys imbricata*), Vulnerable (EPBC Act, BC Act)<br><br>The proposed action is situated in the vicinity of known nesting habitat for marine turtles, being the portion of beach immediately adjacent to the proposed action. This area is identified as the Lighthouse Bay Section in the NTP North West Cape Division and includes Hunters Beach adjacent to the across to Mildura Beach identified as the Lighthouse Bay. Baseline data on the use of the beach by nesting females was collected as part of the NTP program (DBCA 2020 in Pendoley 2021b). |
| Is the action likely to directly or indirectly impact upon animal species? | Clearing of native vegetation will result in the direct impact of permanent loss of 3.98 ha of native vegetation and associated terrestrial habitat (vertebrate and invertebrate SREs). |
| • Will the action result directly or indirectly in animal deaths or injury?<br>• Will the action impact upon habitat, water or other | Potential project related indirect impacts include habitat degradation (e.g. through altered fire regimes, weeds) and fragmentation; increased attraction of predators or competitors; death or injury from vehicle movements, particularly during earthworks and construction. |

| Animal species | Context of Proposed Action |
|---|---|
| resources utilised by animals? | Groundwater abstraction may result in direct impact of lowering of the water table reducing available habitat for subterranean fauna. Project related activities may also result in indirect changes to habitat through changes in groundwater quality (e.g. from nutrients; pollutants such as fuel infiltrating groundwater).<br><br>Artificial lighting at night may increase sky glow and indirectly impact hatchling or adult nesting female marine turtle orientation behaviour, causing disorientation or misorientation and reduce breeding success.<br><br>Change in sky glow resulting from artificial lighting at night may impact on behaviour of birds in flight, including disorientation; and may alter foraging behaviours causing either disruptions or increased exposure to predators also attracted to the light. |
| Is the action likely to impact upon animal species that are rare, endemic or otherwise valuable?<br><br>• For example, listed threatened species and listed migratory species.<br>• Feeding, nesting, breeding areas. | The action may indirectly impact upon the following listed conservation significant species either found to occur within, or which is known to occur within proximity of the proposed action development envelope:<br><br>**Listed threatened species - terrestrial**<br><br>Black-flanked Rock-wallaby (*Petrogale lateralis lateralis*) EN<br><br>**Marine and migratory species**<br><br>Osprey (*Pandion haliaetus)* IA<br>Crested Tern (*Thalasseus bergii*) IA<br>Common Sandpiper (*Actitis hypoleucos*) IA<br><br>**Listed threatened species - marine**<br><br>Loggerhead turtle (*Caretta caretta*), EN<br>Green turtle (*Chelonia mydas*), Vulnerable EN<br>Hawksbill turtle (*Eretmochelys imbricata*), Vulnerable EN |

**Table 2-7: Recorded Terrestrial Fauna Species**

| Species | Common Name | Conservation Code |
|---|---|---|
| **Mammals** | | |
| *Felis catus* | Feral Cat | - |
| *Oryctolagus cuniculus* | Common Rabbit | - |
| *Osphranter robustus* | Common Wallaroo | - |
| *Ovis aries* | Sheep | - |
| *Pseudantechinus roryi* | Rory Cooper's False Antechinus | - |
| *Tachyglossus aculeatus* | Short-beaked Echidna | - |
| **Reptiles** | | |
| *Gehyra pilbara* | Pilbara Dtella | - |
| *Lerista allochira* | Cape Range Slider | P3 |

| Species | Common Name | Conservation Code |
|---|---|---|
| *Lerista bipes* | North-western Sandslider | - |
| *Lerista elegans* | Elegant Slider | - |
| *Lerista macropisthopus subsp. fusciceps* | Unpatterned Robust Slider | - |
| *Lerista miopus* | Northern Dotted-line Robust Slider | - |
| *Lerista planiventralis* | Keeled Slider | - |
| *Menetia greyii* | Common Dwarf Skink | - |
| *Morethia lineoocellata* | West Coast Morethia Skink | - |
| *Morethia ruficauda subsp. exquisita* | Lined Firetail Skink | - |
| *Notoscincus ornatus* | Ornate Soil-crevice Skink | - |
| *Simoselaps bertholdi* | Jan's Banded Snake | - |
| **Birds** | | |
| *Aquila audax* | Wedge-tailed Eagle | - |
| *Calamanthus campestris* | Rufous Fieldwren | - |
| *Chroicocephalus novaehollandiae* | Silver Gull | - |
| *Chrysococcyx basalis* | Horsefield's Bronze-cuckoo | - |
| *Circus assimilis* | Spotted Harrier | - |
| *Coracina novaehollandiae* | Black-faced Cuckoo-shrike | - |
| *Corvus orru* | Torresian Crow | - |
| *Cracticus nigrogularis* | Pied Butcherbird | - |
| *Dromaius novaehollandiae* | Emu | - |
| *Elanus axillaris* | Black-shouldered Kite | - |
| *Emblema pictum* | Painted Finch | - |
| *Falco berigora* | Brown Falcon | - |
| *Falco cenchroides* | Australian Kestrel | - |
| *Gavicalis virescens* | Singing Honeyeater | - |
| *Haliastur sphenurus* | Whistling Kite | - |

| Species | Common Name | Conservation Code |
|---|---|---|
| *Lalage tricolor* | White-winged Triller | - |
| *Lichmera indistincta* | Brown Honeyeater | - |
| *Malurus leucopterus* | White-winged Fairy-wren | - |
| *Manorina flavigula* | Yellow-throated Miner | - |
| *Merops ornatus* | Rainbow Bee-eater | - |
| *Pandion haliaetus* | Eastern Osprey | IA |
| *Pardalotus rubricatus* | Red-browed Pardalote | - |
| *Pardalotus striatus* | Striated Pardalote | - |
| *Poodytes carteri* | Spinifexbird | - |
| *Ptilonorhynchus guttatus* | Western Bowerbird | - |
| *Rhipidura leucophrys* | Willie Wagtail | - |
| *Stipiturus ruficeps* | Rufous-crowned Emu-wren | - |
| *Taeniopygia guttata* | Zebra Finch | - |

**Table 2-8: Stygofauna taxa yielded from the borefield and regional bores (Bennelongia 2021)**

| Higher Order Identification | Lowest Identification | Borefield | Regional |
|---|---|---|---|
| **Annelida** | | | |
| **Clitellata** | | | |
| **Oligochaeta** | | | |
| **Enchytraeida** | | | |
| **Enchytraeidae** | Enchytraeidae `3 bundle` s.l. (short sclero) | 1 | |
| | Enchytraeidae sp.# | 1 | |
| **Haplotaxida** | | | |
| **Tubificina** | | | |
| **Tubificidae** | Tubificidae `BOL065` | | 4 |
| | Oligochaeta sp. | 2 | 6 |
| **Arthropoda** | | | |
| **Crustacea** | | | |
| **Malacostraca** | | | |
| **Eumalacostraca** | | | |
| **Amphipoda** | | | |
| **Bogidiellidae** | Bogidiella `BAM203` | | 1 |

| Higher Order Identification | Lowest Identification | Borefield | Regional |
|---|---|---|---|
| **Eriopisidae** | *Nedsia* `*sculptilis* Cape Range` | | 9 |
| | *Nedsia* sp. | | 1 |
| **Paramelitidae** | Paramelitidae sp. | | 1 |
| **Decapoda** | | | |
| **Atyidae** | *Stygiocaris stylifera* | | 7 |
| **Thermosbaenacea** | | | |
| **Thermosbaenacidae** | Halosbaena sp. CRE | | 60 |
| **Maxillopoda** | | | |
| **Copepoda** | | | |
| **Calanoida** | | | |
| **Ridgewayiidae** | *Stygoridgewayia trispinosa* | | 69 |
| **Cyclopoida** | | | |
| **Cyclopidae** | *Diacyclops humphreysi humphreysi* | 1 | 30 |
| | *Metacyclops mortoni* | | 24 |
| **Harpacticoida** | | | |
| **Parastenocarididae** | *Parastenocaris* `BHA286` | 6 | |
| | *Parastenocaris* sp. | 4 | |
| **Nematoda** | Nematoda sp. | 26 | 124 |
| **Rotifera** | | | |
| **Eurotatoria** | | | |
| **Bdelloidea** | Bdelloidea sp. 2:2 | | 100 |
| **Total** | | **41** | **436** |

**Table 2-9: Biodiversity Act 2016 listed seabird and shorebird species occurring within the Proposed action area (Pendoley 2022a)**

| Category | Species | Biodiversity Conservation Act 2016 – Wildlife Conservation (Specially Protected Fauna) Notice 2018 |
|---|---|---|
| Seabirds | Southern Giant, Petrel, *Macronectes giganteus* | IA |
| | Streaked Shearwater, *Calonectris leucomelas* | IA |
| | Wedge-Tailed Shearwater, *Puffinus pacificus* | EN |
| | Hutton's Shearwater, *Puffinus huttoni* | VU |
| | Fleshy-footed Shearwater, *Ardenna carneipes* | EN, IA |
| | Indian Yellow-nosed Albatross, *Thalassarche carteri* | IA |
| | Wilson's Storm Petrel, *Oceanites oceanicus* | IA |
| | Red-Tailed Tropicbird, *Phaethon rubricauda* | IA |

| Category | Species | Biodiversity Conservation Act 2016 – Wildlife Conservation (Specially Protected Fauna) Notice 2018 |
|---|---|---|
| | Lesser Frigatebird, *Fregata ariel* | IA |
| | Gull-billed Tern, *Sterna nilotica macrotarsa* | IA |
| | Caspian Tern, *Sterna caspia* | IA |
| | Crested Tern, Thalasseus bergii | IA |
| | Roseate Tern, *Sterna dougallii* | IA |
| | Common Tern, *Sterna hirundo longipennis* | IA |
| | Little Tern, *Sternula albifrons* | IA |
| | Fairy Tern, *Sterna nereis nereis* | VU, IA |
| | Bridled Tern, *Onychoprion anaethetus* | IA |
| | White-winged Black Tern, *Sterna leucoptera* | IA |
| Birds of Prey | Osprey, *Pandion haliaetus cristatus* | IA |
| | Grey Falcon, *Falco hypoleucos* | VU |
| | Peregrine Falcon, *Falco peregrinus macropus* | OS |
| Shorebirds | Black-tailed Godwit, *Limosa limosa* | IA |
| | Bar-tailed Godwit, *Limosa lapponica menzbieri* | CR, IA |
| | Little Curlew, *Numenius minutus* | IA |
| | Whimbrel, *Numenius phaeopus variegatus* | IA |
| | Eastern Curlew, *Numenius madagascariensis* | CR, IA |
| | Marsh sandpiper, *Tringa stagnatilis* | IA |
| | Common Greenshank, *Tringa nebularia* | IA |
| | Wood sandpiper, *Tringa glareola* | IA |
| | Terek Sandpiper, *Xenus cinereus* | IA |
| | Common Sandpiper, *Actitis hypoleucos* | IA |
| | Grey-tailed Tattler, *Tringa brevipes* | IA |
| | Ruddy Turnstone, *Arenaria interpres* | IA |
| | Asian Dowitcher, *Limnodromus semipalmatus* | IA |
| | Red Knot, *Calidris canutus* | EN, IA |
| | Great Knot, *Calidris tenuirostris* | CR, IA |
| | Sanderling, *Calidris alba* | IA |
| | Red-necked Stint, *Calidris ruficollis* | IA |
| | Long-toed Stint, *Calidris subminuta* | IA |
| | Sharp-tailed Sandpiper, *Calidris acuminata* | IA |

| Category | Species | Biodiversity Conservation Act 2016 – Wildlife Conservation (Specially Protected Fauna) Notice 2018 |
|---|---|---|
| | Curlew Sandpiper, *Calidris ferruginea* | CR, IA |
| | Pectoral Sandpiper, *Calidris melanotos* | IA |
| | Broad-billed Sandpiper, *Limicola falcinellus* | IA |
| | Ruff, *Philomachus pugnax* | IA |
| | Painted Snipe, *Rostratula australis* | EN |
| | Grey Plover, *Pluvialis squatarola* | IA |
| | Pacific Golden Plover, *Pluvialis fulva* | IA |
| | Lesser Sand Plover, *Charadrius mongolus* | EN, IA |
| | Greater Sand Plover, *Charadrius leschenaultii* | VU, IA |
| | Oriental Plover, *Charadrius veredus* | IA |
| | Oriental Pratincole, *Glareola maldivarum* | IA |

## 2.6 Conservation and special use areas

Conservation and special use areas in proximity to the proposed action are described in Table 2-10. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-10: Conservation and special use areas**

| Conservation and special use areas | Context of Proposed Action |
|---|---|
| Are any conservation areas or special use places present?<br>• For example, national parks, conservation reserves, state forests, parkland and marine protected areas, including the Great Barrier Reef Marine Park | The proposed action lies within terrestrial boundary of the coastal area of the Ningaloo Coast World Heritage Area and within the mapped boundary of the National Heritage Place. The geographical extent of the National Heritage Place includes the nearby Ningaloo Marine Park (Commonwealth and State Waters), Jurabi Coastal Park (State) and Cape Range National Park. The beach adjacent to the proposed action lies within the management area of the Jurabi Coastal Park, which is jointly vested in the Shire of Exmouth and the WA Department of Biodiversity, Conservation and Attractions (DBCA). |
| Is the action likely to directly or indirectly impact upon conservation or special use areas? | The proposed action may indirectly impact on a number of key environmental values that align with the conservation values and purposes of these reserves. |
| What is the current use and condition of conservation areas or special use places that are likely to be impacted by the action? | Potential impacts to the World Heritage and National Heritage conservation values, including marine turtles, subterranean waterways and associated fauna, include:<br>• increased water demand leading to increased water abstraction with potential effects on the groundwater systems;<br>• increasing and unmanaged visitation and associated pressures on marine, coastal and terrestrial; habitats within and adjacent to the site; and<br>• introduced plants and animals. |

## 2.7 Heritage places and items

Heritage places and items within proximity to the proposed action are described in Table 2-11. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-11: Heritage places and items**

| Heritage places and items | Context of Proposed Action |
|---|---|
| Are any heritage places or items present?<br>• Are there places with cultural or natural heritage values including places with Indigenous heritage values?<br>• Are there items with heritage value, such as historical artefacts or archaeological remains? | As noted above, The Ningaloo Coast World Heritage Area and National Heritage Place cover the same geographical area. The proposed action lies within terrestrial boundary of the coastal area of the Ningaloo Coast World Heritage Area and within the mapped boundary of the National Heritage Place.<br>The proposed action area (Lot 2 and Lot 557 Yardie Creek Road) lies within the mapped boundary of one State registered Aboriginal site (Vlamingh Head (DPLH ID 10381- ceremonial) which is a place of sacred importance that has a closed or obscured boundary on the Department of Planning, Lands and Heritage (DPLH) public database because of cultural sensitivity.<br>A newly identified site, a red dune, was recorded during the survey of Lot 557 and is hereafter referred to as "Sensitive Dune Area". The Sensitive Dune Area is potentially of importance and significance under section 39(2) (a) and (b) of the *Aboriginal Heritage Act 1976* (WA) (AH Act). Those consulted confirmed that dune crests were places where people were buried in the past. By definition, the act of interring a loved one in accordance with tradition is a ceremony and the resulting grave a place of reverence and ritual attendance. Additionally, artefact scatters found near the coast at the northern tip of the cape have often been found on the crest of sand dunes, and this dune is in proximity to a number of significant landscapes such as Vlamingh Head and the northern end of the range. |
| Will the action directly or indirectly impact upon heritage places or items?<br>• Will the action damage, destroy, remove, alter or modify a heritage place or item?<br>• Is the action inconsistent with the heritage values of heritage places?<br>Will the action impact upon heritage places or items which are very rare or have special value?<br>• For example, National Heritage places, Commonwealth Heritage places, the Great Barrier Reef Marine Park. | The proposed action activities, such as groundwater abstraction, clearing of <4 ha of native vegetation, ground disturbance, and artificial lighting at night, may:<br>• Impact relevant National Heritage Values such as subterranean waterways (directly via groundwater drawdown and indirectly via potential for changes in water quality), rangeland communities (directly via vegetation clearing) of the Exmouth Peninsula; and Indigenous Values (directly through ground disturbance and groundwater abstraction).<br>• Impact on relevant World Heritage Criteria, including landscapes and seascapes (indirectly via visual impacts); diversity of marine turtles (indirectly via artificial lighting at night) ; subterranean species (directly via groundwater drawdown and indirectly via potential for changes in water quality)<br>• Directly impact the State registered Aboriginal site (Vlamingh Head (DPLH ID 10381, through ground disturbance.<br>The assessment provided in the ERD has determined that the action is not inconsistent with the heritage values of heritage places. Refer to Appendix A for a copy of the assessment tables with respect to National and World Heritage values of the Ningaloo Coast. |
| What is the condition and current | The third IUCN World Heritage Conservation Outlook for the Ningaloo Coast in |

| Heritage places and items | Context of Proposed Action |
|---|---|
| use of the heritage place or items? | 2020, has downgraded the rating from 'Good' to 'Good with some concerns' (IUCN 2021). The analysis identifies climate change as the leading reason for this reclassification and highlights a number of other major threats to Ningaloo including those posed by oil and gas and coastal development, as well as fishing effort.<br><br>Increasing visitation, recreational use and associated pressures on marine, coastal and terrestrial habitats within and adjacent to the site continue as major threats. Unmanaged visitor access, visitor recreation activities and introduced plants and animals continue to remain major threats to the World Heritage property. |

## 2.8 Renewable or non-renewable natural resources

Sources of renewables or non-renewable resources in the area are described in Table 2-12. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-12: Renewable or non-renewable natural resources**

| Renewable or non-renewable natural resources | Context of Proposed Action |
|---|---|
| Are there any sources of renewable or non-renewable resources in the area?<br><br>• For example, oil, gas, coal, sand or other minerals, forests or woodlands, ground or surface water, fish or crustaceans. | The key resource in proximity to the proposed action area that will be utilised as part of the action is groundwater from within and immediately south of the site. |
| Is the action likely to utilise, impact upon or restrict access to renewable or non-renewable resources, either directly or indirectly? | The proposed action will directly impact upon groundwater, as a result of increased abstraction required to support the proposed action. |
| Will the action impact upon renewable or non-renewable resources that are rare or have special value? | Groundwater resources to be utilised lie within the mapped area of the Cape Range Subterranean Waterways (Section 2.3). |
| What are the existing uses of renewable and non-renewable resources?<br><br>• How are the resources currently used?<br>• What is the current availability of resources?<br>• What is the current level of demand for resources? | Groundwater is currently Exmouth's only source of freshwater, with abstraction of groundwater and localised groundwater drawdowns recognised as risks since Exmouth was established in the 1960s (WAMSI 2021). Allocation of groundwater resources are managed and licensed by the WA Department of Water and Environmental Regulation (DWER) under the RIWI Act (Section 2.3). For management purposes, the Exmouth groundwater area is divided into groundwater management subareas that reflect groundwater availability and accessibility.<br><br>Existing groundwater users include the Department of Defence Harold E Holt naval base borefield situated 4.88 km from the Proposed action area and the Exmouth townsite which occurs approximately 18 km to the south of the proposed action (Figure 2-2). |

| Renewable or non-renewable natural resources | Context of Proposed Action |
|---|---|
| | The proposed increased allocation required for the proposed action has been approved by DWER (subject to approval under Part IV of the EP Act) in consideration of the Exmouth Groundwater Subarea Allocation Plan. |

## 2.9 Utilities, energy, and transport, resources and infrastructure

Utilities, energy ,and transport, resources and infrastructure in the area are described in Table 2-13. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-13: Utilities, energy ,and transport, resources and infrastructure**

| Utilities, energy ,and transport, resources and infrastructure | Context of Proposed Action |
|---|---|
| Is there existing energy and transport resources and infrastructure in the area?<br>• For example, electricity and water supply, roads, public transport | The proposed action is located approximately 18 km northwest of the town of Exmouth towards the northern tip of the Cape Range Peninsula.<br>The town is serviced by:<br>• a network of sealed and unsealed public roads, extending into the Cape Range National Park;<br>• three boat ramp facilities;<br>• the Exmouth Power Station ( powered by a combination of compressed natural gas and diesel generators);[2]<br>• the Exmouth Town Water Supply , operated by the Water Corporation, which draws water from a large number of low yielding bores situated along the eastern margin of the Cape Range;<br>• The Exmouth Wastewater Treatment Plant (Water Corporation); and<br>• The Qualing Scarp Landfill site (Shire of Exmouth). |
| Will the action utilise, impact upon, or restrict access to existing utilities, energy, and transport resources and infrastructure, or require additional resources or infrastructure? | The proposed action will utilise existing infrastructure and utilities where possible, which includes power generation, road networks and landfill.<br>However, due to its location, the proposed action will require its own water supply and wastewater treatment and disposal infrastructure. |
| What are the existing uses of renewable and non-renewable resources?<br>• How are the resources or infrastructure currently used?<br>• What is the current availability | Existing uses of resources and infrastructure within the Exmouth Gulf region include residential, tourism, retail, mineral and petroleum development, fishing, horticulture and pastoralism.<br>The Western Australian Marine Science Institution (WAMSI) (2021) report *Cumulative Pressures on the Distinctive Values of Exmouth Gulf* identifies the current and forecast uses of the Exmouth Gulf, which gives an indication of the |

[2] https://www.horizonpower.com.au/your-community/getting-future-ready/exmouth-integrated-resource-planning/

| Utilities, energy ,and transport, resources and infrastructure | Context of Proposed Action |
|---|---|
| of resources or infrastructure?<br>• What is the current level of demand for resources or infrastructure? | current and projected demand for resources and infrastructure. This is summarised in Figure 9 of the report, which is reproduced in Figure below. |


Figure 9: Previous, current and potential future activities relating to Exmouth Gulf. Where possible, further detail and source of information is provided. [1]Environmental Protection Authority, [2]NationalMap, [3]Shire of Exmouth tenders, [4]Gascoyne Regional Investment Blueprint – Gascoyne Development Commission, [5]W.A. Labor Plan for NW Central, [6]Draft aquaculture plan for Exmouth Gulf 2004, [7]Aquaculture Development Plan for Western Australia , [8]Gascoyne Gateway Limited , [9]ACIL Allen Consulting 2019 - Economic benefits assessment of Exmouth Marine Infrastructure Project Final Report, [10]Whalebone Wyloo Metals.

**Figure 2-3: Previous current and potential future activities relating to Exmouth Gulf (WAMSI 2021)**

## 2.10 People and communities

People and communities in the area are described in Table 2-14. The key avoidance, mitigation and management measures are presented in Table 3-1.

**Table 2-14: People and communities**

| People and communities | Context of Proposed Action |
|---|---|
| Are there people or communities in the area? | The proposed action is located approximately 18 km northwest of the town of Exmouth, a community with a resident population of approximately 3205.[3]<br><br>Exmouth and Ningaloo are in Australia's Coral Coast tourism region where, at 9.7%, tourism accounts for the highest Gross Value Added (GVA) of any other tourism region. Tourism is the largest industry contributing to the Exmouth and Gascoyne economy.<br><br>The average annual number of overnight visitors to Exmouth is 153,000.[4] |
| Is it likely that the action will directly or indirectly impact upon people or communities?<br><br>• Will the action impact upon the existing social fabric/organisation, for example, culture, demographics, jobs, income?<br>• Will the action impact upon community resources, for example, facilities, infrastructure, services, recreation areas?<br>• Will the action impact upon public amenity?<br>• What activities/uses exist in the area and how is it zoned?<br>• Is the action inconsistent with existing uses? | The proposed action involves the redevelopment of an existing facility, on land that has been used for tourism accommodation (caravan park and resort) for over 30 years. The land<br><br>On the doorstep of the Ningaloo Coast World Heritage Area, the proposed action will be low impact and blend into the natural environment, with a mix of accommodation options to suit many different needs and budgets. Along with meeting the demand for accommodation in the region, the resort proposed action will create local jobs and generate income for local businesses.<br><br>The Proponent is committed to developing a solid and ongoing relationship with the local Baiyungu and Yinnigurrura traditional owners, such that their concerns can be addressed while also presenting diverse opportunities from procurement and employment to cultural heritage management and guest education initiatives.<br><br>The resort occupancy schedule has an allowance for a small number of overnight staff, with the remainder of staff requiring accommodation elsewhere within Exmouth. The Proponent recognises the shortage of accommodation options in town and is committed to investing in the Exmouth community for the long-term.<br><br>The proposed action has been designed to meet State and Local planning requirements, and specifically is located within an area zoned 'Special Use – Zone 2' (SU2) under the Shire of Exmouth Local Planning Scheme No. 4 (LPS4). LSP4 is the primary statutory control on the development and use of land throughout the Shire area. In accordance with the applicable development requirements under Schedule 4 of LPS4, "Tourist Development" land uses can be considered for development approval within the SU2 zone. |

[3] https://www.citypopulation.de/en/australia/admin/western_australia/53360__exmouth/

[4] https://www.tourism.wa.gov.au/Publications%20Library/Markets%20and%20research/2019/Ad-hoc/LGA%20Factsheets/LGA%20Visitor%20Factsheet%202019%20-%20Shire%20of%20Exmouth.pdf

| People and communities | Context of Proposed Action |
|---|---|
| Is the action likely to impact upon sensitive land uses?<br>• For example, schools, hospitals, retirement villages. | No |
| What is the existing social and economic status of people and communities the action is likely to impact upon? | Tourism is the largest industry in the Shire of Exmouth with eco-tourism development experiencing significant growth. Other industries that contribute significantly to the local economy include defence, government services and industries to support the offshore oil and gas industry, tourism support services such as hospitality and accommodation along with fishing, pastoral, aquaculture, light engineering and construction.<br><br>Every year, in the winter months the number of visitors arriving in Exmouth triples the resident population of Exmouth. While this presents significant challenges for a small community with limited financial resources, it also provides important stimulus for the local economy.[5] |

[5] https://www.exmouth.wa.gov.au/council/about-us/about-exmouth.aspx

# 3. Potential Impacts to Commonwealth land – Defence equities

The potential impacts of the proposed action in the context of the environment which will be impacted (Section 3) and in particular as it relates to Defence equities on Commonwealth land, are described in Table 3-1, which includes a summary of the proposed avoidance, mitigation and management measures , as detailed in the ERD.

The Department of Defence (DoD) have identified the NCSHEH as being significantly sensitive to air and light pollution generated within the vicinity of Exmouth. With respect to the proposed action, DoD's key concern and the focus of the environmental impact assessment, is potential indirect impacts The SST located is a world-leading telescope that enables Defence to efficiently track and identify objects and threats in space and provides space domain awareness to both Australia and the United States (DoD 2021).

The potential impacts of the proposed action to Commonwealth land – Defence equities are limited to indirect impacts associated with light spill and night glow from resort lighting and dust generated during construction.

Given the separation distance of the proposed resort from the Solar Observatory, RAAF Base Learmonth and NCSHEH Area C (>50 km), the potential for significant indirect impacts to these facilities as a result of lighting and dust from the proposed action is considered to be negligible. These facilities are not considered further in the impact assessment.

**Table 3-1: Environmental Impacts**

| Elements of environment | Impact questions | Impact within environmental context | Will this impact Commonwealth land (i.e. Defence equities)? | Impact avoidance, mitigation and management |
|---|---|---|---|---|
| **Landscapes and Soils** | Is there a real chance or possibility that the action will:<br>• substantially alter natural landscape features<br>• cause subsidence, instability or substantial erosion, or<br>• involve medium or large-scale excavation of soil or minerals? | The potential impacts of the proposed action is the disruption of the scenic quality of Vlamingh Head and the Ningaloo coastline. The proposed action has been designed to replace existing tourism accommodation and infrastructure, within constraint of existing landscape. | No | The proposed action has been designed to minimise visual impact on, and preserve the scenic quality of, the visual landscape character of Vlamingh Head, including measures such as:<br>• Minimal alteration to natural topography of the site. Existing landforms have been utilised so that development is contained to areas that are naturally concealed from more distant views.<br>• Positioning accommodation buildings in the hillside contours on stilts and locating access ways and nature trails to consider overland water flow, which reduced total cut volumes and minimises impact on existing landforms.<br>• Restricted building heights. New buildings have been kept to a maximum of two storeys with the majority of buildings being single storey.<br>• Use of building materials designed to visually integrate minor structures into the landscape.<br>• Where new buildings have been proposed, tree planting has been included in the areas adjacent new buildings to minimise visual impact.<br>Service and infrastructure buildings have been consolidated and set within a natural 'hollow' in the landscape.<br><br>The Proponent will implement the management and mitigation measures specified within the Construction Environmental Management Plan (CEMP) to ensure potential erosion impacts during construction are avoided where possible and otherwise minimised. |
| | | There is potential for minor erosion during construction if rainfall events occur. | No | |
| | | The proposed action requires some excavation and earthworks associated with construction activities | Indirect impact – soil excavation for construction may increase atmospheric dust levels. | |
| **Coastal landscapes and processes** | Is there a real chance or possibility that the action will:<br>• alter coastal processes, including wave action, sediment movement or accretion, or water circulation patterns | The proposed Development Area is located within an existing tourism facility, located approximately 20m behind the dunes of the Lighthouse Beach bay, which forms part of the coastal zone of the Ningaloo Marine Park. The current resort is separated from the coastal area by Yardie Creek Road. No direct or indirect impacts are predicted. | No | The proposed buildings and assets of a more permanent nature within the Resort are located above and behind the potential inundation levels and coastal erosion hazard allowances respectively.<br><br>The Proponent will continue to consult with DBCA, who are responsible for the management of the Ningaloo Coast, particularly with respect to supporting sustainable nature-based tourism experiences, to provide appropriate signage and other visitor management measures. This includes designing the foreshore access track as a formal pathway to discourage access through the coastal dunes.<br><br>The Proponent will implement the management and mitigation measures within the Visitor Management Plan, including visitor education, signage, designated paths etc, to ensure visitor impacts within the control of the Proponent are reduced to as low as reasonably practicable. |
| | • permanently alter tidal patterns, water flows or water quality in estuaries | Not applicable | No | |
| | • reduce biological diversity or change species composition in estuaries, or | Not applicable | No | |
| | • extract large volumes of sand or substantially destabilise sand dunes? | There is potential form increased visitor access through the adjacent dunes that may indirectly impact on dune stabilisation. | No | |
| **Ocean forms, ocean processes and ocean life** | Is there a real chance or possibility that the action will:<br>• reduce biological diversity or change species composition on reefs, seamounts or in other sensitive marine environments | The proposed action will result in increased light emissions and will alter dark sky values, that may impact marine turtle nesting and hatchling behaviour on adjacent beaches. | No | Control measures, including monitoring and adaptive management, will eliminate light spill and shield any light directly visible at the nesting habitat, and minimise additional skyglow, reducing potential impacts to hatchling turtles. Should any changes in nesting turtle or hatchling behaviour on the local beaches be detected (e.g. misorientation or disorientation) pre- and post-construction, and throughout operations, adaptive management will identify and rectify potential impacts to prevent long term decline.<br>The Proponent will implement management and mitigation measures as specified within the Turtle Management Plan to avoid where possible and minimise potential impacts to marine turtles on adjacent beaches. |
| | • alter water circulation patterns by modification of existing landforms or the addition of artificial reefs or other large structures | Not applicable | No | |

| Elements of environment | Impact questions | Impact within environmental context | Will this impact Commonwealth land (i.e. Defence equities)? | Impact avoidance, mitigation and management |
|---|---|---|---|---|
| | • substantially damage or modify large areas of the seafloor or ocean habitat, such as sea grass | Not applicable | No | |
| | • release oil, fuel or other toxic substances into the marine environment in sufficient quantity to kill larger marine animals or alter ecosystem processes, or | No | No | |
| | • release large quantities of sewage or other waste into the marine environment? | No | No | |
| **Water resources** | Is there a real chance or possibility that the action will:<br>• measurably reduce the quantity, quality or availability of surface or ground water | The proposed action requires an increase in licensed groundwater abstraction from 30 ML/year to up to 72 ML/yr which is a measurable reduction of available groundwater.<br>The proposed action includes a plan to irrigate gardens and open space with treated wastewater to preserve potable water supplies in the semi-arid environment. Residual nutrients within the treated wastewater may infiltrate to the groundwater if not fully utilised by plants.<br>The proposed action includes use of vehicles and possibly refuelling activities, which may result in unplanned hydrocarbon releases to ground, which may infiltrate to the groundwater. | No | **Surface water**<br>No surface wetlands or watercourses are present the immediate vicinity of, or adjacent area of the proposed action.<br>The existing natural drainage at the site occurs via a large central swale which captures most of the water from the high areas of the site to the south and west, and naturally flows towards the dunes on the other side of Yardie Creek Road.<br>Surface water flow will be maintained by diverting flow around structures using natural contours and swales for infiltration. Positioning accommodation buildings in the hillside contours on stilts and locating access ways and nature trails, reduces total cut volumes while minimising impact to existing landforms and maintains overland water flow. Raised boardwalk will not only promote migration of surrounding dune vegetation into the resort but will also enable surface flow paths to be maintained.<br>The low-density nature of the development and the highly permeable sand and significant depth to groundwater at the site allow for development to occur with minimal need for constructed stormwater management infrastructure. Stormwater drainage collected from new roads and building developments will be disposed of by means of infiltration via swales, both roadside and natural, throughout the site<br>**Groundwater**<br>The production water bores in the new borefield have been designed for groundwater sipping, and as such are only screened over the first 3 m below the water table and will not intercept the saltwater interface which is at least 10 m below the base of the production bore screens (this is conservative considering that the pilot hole drilling results show that the saltwater interface is at least 15 m below the base of the bores).<br>Groundwater abstraction is being undertaken in accordance with groundwater licence(s) (GWL) issued in accordance with the RIWI Act and the associated groundwater licence operating strategy. The application for increased abstraction licence has been assessed and granted by DWER in consideration of the Exmouth Groundwater Subarea Allocation Plan.<br>Borefield design characteristics that minimise the impact of the borefield include:<br>• The southern production water bores have been designed for groundwater sipping, and as such are only screened over the first 3 m below the water table.<br>• All production bores would be continuously pumped at 0.5 L/sec through the tourist season.<br>• A new deep saline water bore within Lot 2 will be available to supplement groundwater. This has been drilled to approximately 40m depth, and has been sealed off from the brackish water lens (cement plug) to prevent saline intrusion into this brackish zone. |
| | • channelise, divert or impound rivers or creeks or substantially alter drainage patterns, or | No rivers or creeks will be impacted as a result of the proposed action.<br>The redevelopment may result in changes to existing surface water flow paths, through alteration of the natural landforms for construction of buildings and ancillary facilities, roads and paths. This may lead to a change in flow to surrounding vegetation or potential flooding during extreme rainfall events that may occur. | No | |
| | • measurably alter water table levels? | The hydrogeological assessment for the proposed action (Pennington Scott 2021a) projected the maximum drawdown (over the high season) is likely to cause a maximum discernible drawdown impact extending up to 370 m from both the new southern borefield and the existing borefield (Figure 2-2).<br>The highest drawdown in each production bore is predicted to range from 0.4 m to 0.6 m, within the brackish water zone. The existing borefield will be serviced by a deep saline bore (at least 10m+ below the brackish zone), plugged below the brackish zone so there is no opportunity for drawdown and potential saline up-coning to impact on the brackish water zone. | No | |

| Elements of environment | Impact questions | Impact within environmental context | Will this impact Commonwealth land (i.e. Defence equities)? | Impact avoidance, mitigation and management |
|---|---|---|---|---|
| | | | | Groundwater quality will be monitored in accordance with the Inland Water Environmental Management Plan (IWEMP) and adaptive management measures will be implemented as specified within the IWEMP, in the event trigger or threshold criteria are met or exceeded during the life of the proposed action. |
| **Pollutants, chemicals, and toxic substances** | Is there a real chance or possibility that the action will:<br>• generate smoke, fumes, chemicals, nutrients, or other pollutants which will substantially reduce local air quality or water quality | The proposed action will result in the generation of:<br>• artificial light emissions at night and dust emissions from earthworks and construction activities will create sky glow at night, and add to cumulative impact of existing sources of night glow (such as NCSHEH facility; Exmouth township) that may impact darks sky values; and<br>• residual nutrients within treated wastewater which may infiltrate groundwater if not taken up by the irrigated vegetation. | The DoD have identified the NCSHEH as being significantly sensitive to air and light pollution generated within the vicinity of Exmouth. .<br>Indirect impacts associated with the proposed action include light spill and night glow from resort lighting and dust generated during construction.<br>Given the separation distance of the proposed resort from the Solar Observatory, RAAF Base Learmonth and NCSHEH Area C (>50 km), the potential for significant indirect impacts to these facilities as a result of lighting and dust from the proposed action is considered to be negligible. The focus of this assessment is on the SST. | **Irrigation of treated wastewater**<br>The proposed wastewater treatment system is designed to remove nutrients and pathogens within the wastewater, suitable for site irrigation in accordance with the requirements of State regulatory bodies, DWER and Department of Health and the Shire of Exmouth. The existing lined evaporation ponds will be retained for additional storage capacity of treated wastewater in the event irrigation is not possible (e.g., extreme rainfall conditions).<br>**Chemical and fuel storage**<br>Chemical storage within the wastewater treatment plant will be bunded in accordance with AS3780-2000.<br>Fuel storage will be required to be compliant with the *Dangerous Goods Act 2004* (WA) and relevant legislation and AS1940, e.g., above ground storage to be bunded and underground storage to be in appropriate double skinned tanks with leak detection capability.<br>**Groundwater Monitoring and Management**<br>Groundwater quality will be monitored in accordance with the Inland Water Environmental Management Plan (IWEMP) and adaptive management measures will be implemented as specified within the IWEMP, in the event trigger or threshold criteria are met or exceeded during the life of the proposed action.<br>**Dust**<br>Airborne dust generated during construction activities will be temporary, localised and predominantly associated with land clearing activities. Construction activities will occur during daylight hours and water-based dust suppression measures, such as water carts and sprinklers, will be implemented to minimise dust emissions. Sealed paths, access ways and roads are to be constructed as part of the development, with remaining cleared areas to be landscaped, which will minimise dust generation from these areas once operational.<br>The Proponent will implement the dust control measures within the CEMP to ensure dust levels are reduced to as low as practicable.<br>**Dark sky values**<br>The key risk to dark sky values associated with the proposed action is light pollution. The Proponent will implement the lighting strategy, lighting management and mitigation measures, described in the Artificial Light Management Plan (ALMP). These measures aim to reduce the output of light from the proposed action to as low as reasonably practicable; and ensure proposed action related sources of light are not directly visible from turtle nesting beaches or the SST when compared to modelled impacts. The measures are based on best practice lighting design principles, modified from the Commonwealth Guidelines (2020) to be specific to the proposed action and key sensitive receptors (wildlife and the SST).<br>The proposed lighting strategy, lighting management and mitigation measures, as described in the ALMP, aim to reduce the output of light from the proposed action to as low as reasonably practicable; and ensure proposed action sources of light are not directly visible from the SST (or turtle nesting beaches). The measures are based on best practice lighting design principles, modified from the Commonwealth Guidelines (2020) to be specific to the proposed action and key sensitive receptors (wildlife and the SST) (Pendoley 2021b), that is:<br>• use minimum number and intensity of lights; |
| | • result in the release, leakage spillage, or explosion of flammable, explosive, toxic, radioactive, carcinogenic, or mutagenic substances, through use, storage, transport, or disposal | The proposed action requires the storage of chemicals for the water and wastewater treatment plants; and fuel for vehicles or generator, where, there is the potential for unplanned spills as a result of refuelling and/or storage. | No | |
| | • increase atmospheric concentrations of gases which will contribute to the greenhouse effect or ozone damage, or | The proposed action will contribute to global GHG concentrations from:<br>• Direct emissions from the clearing of native vegetation and operation of machinery and plant equipment (173 t CO2-e of Scope 1 emissions); and<br>• Indirect emissions from the consumptions of electricity (911 tCO2-e /year Scope 2 emissions). | No | |
| | • substantially disturb contaminated or acid-sulphate soils? | The proposed action is not located within an area at risk of acid-sulphate soils. | No | |

| Elements of environment | Impact questions | Impact within environmental context | Will this impact Commonwealth land (i.e. Defence equities)? | Impact avoidance, mitigation and management |
|---|---|---|---|---|
| | | | | • adapt lighting for colour, intensity and timing;<br>• light only the area intended; and<br>• use non-reflective, dark coloured surfaces.<br>The Proponent will consult with DoD to ensure the lighting management plan adequately addresses specific lighting management and ongoing monitoring measures required by DoD. |
| **Plants** | Is there a real chance or possibility that the action will:<br>• involve medium or large-scale native vegetation clearance | No - only small scale native vegetation clearing is proposed (<4 ha) | No | The key mitigation measures for flora and vegetation are:<br>• Planning and design of buildings and associated infrastructure and tracks to utilise all the existing disturbed areas, to limit the amount of clearing required for new facilities.<br>• Minimising risk of human sources of bushfire ignition by managing vegetation fuel loads within the action area particularly in the vicinity of power network and fuel service station and providing designated smoking areas and butt bins throughout the facility.<br>• Minimise fire risk through landscaping with low-threat and managed gardens, planted sparsely enough to achieve exclusion in accordance with AS 3959—2018 Construction of Buildings in Bushfire-Prone Areas (AS 3959; SA 2018).<br>• Active weed management throughout the proposed action construction and subsequent operation (e.g., spraying, removal). In particular, the planted invasive species, **Tamarix aphylla* are proposed to be removed part of the redevelopment and replaced with native vegetation. Weed management will include management measures to identify and management any invasive flora introduced to the resort.<br>• Management of visitor access through dunes to the beach adjacent to the proposed action (responsibility of the Shire of Exmouth) to be assisted by designing the foreshore access track within the proposed action as a formal pathway to discourage uncontrolled access through the coastal dunes.<br>• Revegetation of cleared and degraded areas through landscaping around the development, utilising native grassland and shrub mixes and sparse trees, to mimic the surrounding hummock grassland and dune vegetation found currently surrounding the site. |
| | • involve any clearance of any vegetation containing a listed threatened species which is likely to result in a long-term decline in a population or which threatens the viability of the species | No EPBC Act-listed Threatened Flora have been recorded in the vicinity of the proposed action area.<br>The vegetation supports at least three terrestrial fauna habitats, which may support *Petrogale lateralis lateralis* (Black-flanked Rock-wallaby) which is listed as Endangered under the EPBC Act. | No | |
| | • introduce potentially invasive species | There is a risk of introduction or spread of existing weed populations through earthworks and associated vehicle and equipment movements. | No | |
| | • involve the use of chemicals which substantially stunt the growth of native vegetation, or | Not applicable | No | |
| | • involve large-scale controlled burning or any controlled burning in sensitive areas, including areas which contain listed threatened species? | Not applicable | No | |
| **Animals** | Is there a real chance or possibility that the action will:<br>• cause a long-term decrease in, or threaten the viability of, a native animal population or populations, through death, injury or other harm to individuals | There is a possibility of death or injury to terrestrial fauna individuals as a result of vehicle movements, especially during earthworks phase of the proposed action. | No | • Planning and design of buildings and associated infrastructure and tracks to utilise all the existing disturbed areas, to limit the amount of clearing required for new facilities.<br>• Reduced speed within the resort area during construction and operations to minimise risk of vehicle impacts to fauna. All vehicles will remain on designated tracks and roads within the resort. Roads will be sealed during operational use.<br>• Construction and clearing will only occur during daylight hours to minimise the effects from noise, artificial light and vibration.<br>• In the event of a vehicle strike, all fauna injuries will be dealt with by qualified personnel, including where an animal must be humanely euthanised.<br>• Minimising risk of human sources of bushfire ignition by managing vegetation fuel loads within the proposed action area particularly in the vicinity of power network and fuel service station and providing designated smoking areas and butt bins throughout the facility.<br>• Minimise fire risk through landscaping with low-threat and managed gardens, planted sparsely enough to achieve exclusion in accordance with AS 3959—2018 Construction of Buildings in Bushfire-Prone Areas (AS 3959; SA 2018).<br>• Active weed management throughout the proposed action development and subsequent operation (e.g., spraying, removal). In particular, the planted invasive species, **Tamarix aphylla* are proposed to be removed part of the |
| | • displace or substantially limit the movement or dispersal of native animal populations | There is the possibility that some native fauna may be displaced during the clearing of native vegetation (3.98 ha) | No | |
| | • substantially reduce or fragment available habitat for native species; | The clearing of 3.98 ha of native vegetation contiguous with existing disturbance is unlikely to substantially reduce or fragment habitat | No | |
| | • reduce or fragment available habitat for listed threatened species which is likely to displace a population, result in a long-term decline in a population, or threaten the viability of the species | The endangered Black-flanked Rock-wallaby (*Petrogale lateralis lateralis)* are known to occur within 2km of the proposed action area. They inhabit rocky areas, caves, cliffs, screes and rock piles, where they shelter during the daytime. Less than 2% of this habitat type occurs within the vegetation to be cleared. | No | |

| Elements of environment | Impact questions | Impact within environmental context | Will this impact Commonwealth land (i.e. Defence equities)? | Impact avoidance, mitigation and management |
|---|---|---|---|---|
| | • introduce exotic species which will substantially reduce habitat or resources for native species, or | The proposed action may result in the spread or introduction of weeds that may reduce habitat resources.<br>Introduced fauna, such as those recorded within the survey area, often thrive in disturbed or modified habitats, such as the existing caravan park and may compete with local species for food and habitat resources. Increased predation (e.g. cats, foxes) may result in changes to species assemblage, often resulting in the loss of native species. | No | redevelopment and replaced with native vegetation.<br>• Active pest management which does not include the use of rodenticide. Pest management will include trapping techniques selective for each of the feral species and approved by government agencies (e.g. DBCA).<br>• Implement good waste management practices, including ensuring all waste materials are appropriately segregated and stored in bins or other containers with lids, to prevent windblown waste or artificial water sources (e.g. in empty containers), and access by fauna.<br>• Implement lighting design for the proposed action based around Best Practice Lighting Principles which will reduce the light emissions to as low as reasonably practicable:<br>○ Use minimum number and intensity of light;<br>○ Adapt lighting for colour, intensity and timing (such as using long wavelength lighting to reduce the possibility of seabird and shorebird species becoming attracted to or disoriented by the proposed action lighting when undertaking nocturnal activities at sea);<br>○ Light only the area intended; and<br>○ Use non-reflective, dark coloured surfaces.<br>• Implement the ALMP during construction and operations, including:<br>○ Implementation of the control measures specified in the plan, wherever practicable;<br>○ Undertake at least one audit recommended in the plan; and<br>○ Implement adaptative management measures in the event that annual monitoring identifies lighting impacts on marine birds as a result of the proposed action, such as changing wavelength of light for the species interacting; additional shielding, changing orientation and direction of light fittings and a review of night-time activities.<br>• Provide formalised beach access points to connect with existing beach access trails in consultation with the Shire of Exmouth and DBCA in whom the adjacent coastal area of Jurabi Coastal Park is jointly vested.<br>• Implement visitor management plan including education programme for guests and visitors to raise awareness of:<br>○ shorebird and seabird, nesting roosting and foraging habitats;<br>○ appropriate waste disposal and bin locations, to avoid providing artificial food and water sources for local wildlife; and<br>○ not feeding wildlife, particularly the local dingo population and the risk of aggression towards people.<br>• Revegetation of cleared and degraded areas through landscaping around the development, utilising native grassland and shrub mixes and sparse trees, to mimic the surrounding hummock grassland and dune vegetation found currently surrounding the site.<br>• Implement the management and mitigation measures within the Construction Environment Management Plan to avoid where possible and mitigate impacts to terrestrial fauna specific to construction activities where they are at higher risk of impacts related to the proposed action. |
| | undertake large-scale controlled burning or any controlled burning in areas containing listed threatened species? | Not applicable | No | |
| **People and communities** | Is there a real chance or possibility that the action will:<br>• substantially increase demand for, or reduce the availability of, community services or infrastructure which have | The proposed action will require access to existing Exmouth power supply, public roads, waste disposal (Exmouth landfill) and housing for staff. As the proposed action is replacing an existing facility with no proposed increase in overnight numbers and it is | No | The resort will utilise the existing road network for access. The proposed Yardie Creek Road Realignment has now been terminated.<br>Wastes will be removed for disposal to the Shire of Exmouth landfill facility, or other licensed facilities appropriate to the type of waste. However, another sustainability |

| Elements of environment | Impact questions | Impact within environmental context | Will this impact Commonwealth land (i.e. Defence equities)? | Impact avoidance, mitigation and management |
|---|---|---|---|---|
| | direct or indirect impacts on the environment, including water supply, power supply, roads, waste disposal, and housing | not anticipated this will result in a substantial increase in demand for access to community service and infrastructure. | | initiative under consideration is the use of a biodigester to convert food wastes into mulch for use in landscaping within the resort, diverting waste from landfill.<br>Power will be supplied via Horizon Power's existing network.<br>The resort occupancy schedule has an allowance for a small number of overnight staff, with the remainder of staff requiring accommodation elsewhere within Exmouth. The Proponent recognises the shortage of accommodation options in town and is committed to investing in the Exmouth community for the long-term |
| | • affect the health, safety, welfare or quality of life of the members of a community, through factors such as noise, odours, fumes, smoke, or other pollutants | No | No | |
| | • cause physical dislocation of individuals or communities, or | No | No | |
| | • substantially change or diminish cultural identity, social organisation or community resources? | No | No | |
| **Heritage** | Is there a real chance or possibility that the action will:<br>• permanently destroy, remove or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place | The proposed action includes the restoration of a State listed a pair of lighthouse keepers' quarters, currently known as Powell House, which falls within the State Register curtilage of the Vlamingh Head Lighthouse Group (Heritage Place no 00837-constructed 1912; 1943-46; 1990s). | No | **State listed heritage place**<br>The proposed action includes the adaptation of the former Lighthouse Quarters for use as the main reception, concierge and bar. The developments' adaptation of significant fabric is restricted to the Lighthouse Quarters. No change is proposed to the other elements of the significant built fabric of the site.<br>The approach adopted for the house is to enhance its present deteriorated state by conservation of the existing elements to the extent that is possible with the adaptation requirements, and to present and interpret it to a high standard.<br>The amount of internal demolition has been limited to that necessary for a reception function. Negative impact is mitigated through:<br>• Retention of nibs and a ground plane indication for removed walls.<br>• Retention of existing fire places;<br>• Maintenance of symmetry in new works.<br>• Reinstatement of veranda elements and general external conservation.<br>The proposed action provides an opportunity for the protection of the heritage values of this place.<br>**Ningaloo World Heritage Criteria and National Heritage Values** – refer to Appendix A.<br>**Aboriginal Heritage**<br>The *Sensitive Dune Area* site within Lot 557 will be avoided and will not be impacted by the proposed action. Tourists will be encouraged away from the landform with use of alternative pathways. The *Section 91 Water Bores Avoidance Area One* site will be avoided by deviation of the access track to the east. The old track will be blocked to prevent further vehicle access.<br>Minimisation measures include:<br>• Limit disturbance within Lot 2 to the area approved under the Aboriginal Heritage Act (WA) consent to minimise disturbance to the Vlamingh Head site.<br>• Implementation of a Cultural Heritage Management Plan to be developed in consultation and agreement with the Traditional Owners (this process has commenced).<br>• Design and install access ways leading away from the Vlamingh Head site to ensure that tourist activity is directed away from this area and that respect |
| | • involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place | | No | |
| | • involve the erection of buildings or other structures adjacent to, or within important sight lines of, a heritage place which are inconsistent with the heritage values of the place | The proposed action requires demolition and replacement of infrastructure surrounding the State listed place.<br>The proposed action may:<br>• Impact relevant National Heritage Values and World Heritage Criteria, including landscapes and seascapes (indirectly via visual impacts);<br>• Directly impact the State registered Aboriginal site (Vlamingh Head (DPLH ID 10381, through ground disturbance.<br>The assessment provided in the ERD has determined that the action is not inconsistent with the heritage values of heritage places. Refer to Appendix A for a copy of the assessment tables with respect to National and World Heritage values of the Ningaloo Coast. | No | |
| | • substantially diminish the heritage value of a heritage place for a community or group for which its significant | The existing facility and proposed action is located within the mapped boundary of one registered Aboriginal site, Vlamingh Head (DPLH ID 10381-ceremonial). Vlamingh Head is a place of sacred importance that has a closed or obscured boundary on the DPLH public database because of cultural sensitivity.<br>Two newly identified sites, *Sensitive Dune Area,* and *Water Bores Avoidance Area One* was found as part | No | |

| Elements of environment | Impact questions | Impact within environmental context | Will this impact Commonwealth land (i.e. Defence equities)? | Impact avoidance, mitigation and management |
|---|---|---|---|---|
| | | of initial surveys undertaken for the proposed action. This site will not be directly impacted by the action.<br>The proposed action and associated activities will have direct impact on the physical land through activities occurring within the site boundary and indirect impacts associated with increased visitation to the area, and groundwater abstraction on both the physical environment and ethnographic values. | | • for the spiritual values of the cape are encouraged.<br>• Maintain ongoing communication with the Aboriginal Stakeholder group and consult in relation to the management of identified Aboriginal heritage sites and places and cultural heritage within the proposed action area.<br>As the new alignment of the borefield access track becomes the preferred track then the sand plain and vegetation should reclaim the area of the site that is within the track. The Yamatji Marlpa Aboriginal Corporation (YMAC) note that the area of the track within the site should not be subject to active rehabilitation efforts as this will cause more disturbance. |
| | • substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place, or | No | No | |
| | • substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site? | The proposed action will not alter the current access or use of the Vlaming head site by the Traditional Owners and knowledge holders. | No | |

# 4. Environmental Outcomes – Commonwealth Land

The proposed action will be implemented in accordance with the management, mitigation and monitoring measures described within the ERD and, in particular as specified within the CEMP and ALMP, to ensure that there will be no adverse impacts to dark sky values as measured from the SST as a result of the proposed action.

The proposed action will be subject to monitoring, with triggers and thresholds to guide the implementation of adaptive management measures so this outcome can be met for the SST, in consultation with DoD.

# 5. References


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Bennelongia 2021b, Ningaloo Lighthouse Resort: Stygofauna Survey Report, Prepared for Tattarang Pty Ltd by Bennelongia Environmental Consultants Pty Ltd, April 2021.

Department of Sustainability, Environment, Water Population and Communities, Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth Agencies, Significant impact guidelines 1.2, Environment Protection and Biodiversity Conservation Act 1999. Australian Government, 2013.

Meissner, R., 2010, Biodiversity values of unallocated Crown land on Cape Range Peninsula, Report prepared by Rachel Meissner for the Department of Environment and Conservation (now Department of Biodiversity, Conservation and Attractions), 2010.

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Pendoley 2021b, Northwest Resorts Lighthouse Resort Development: Artificial Light Assessment and Management Plan, Report prepared by Pendoley Environmental Pty Ltd for Northwest Resorts Pty Ltd, April 2021.

Pendoley 2022a, Northwest Resorts Lighthouse Resort Development: Seabird and Shorebird Review and Artificial Light Assessment, Report prepared by Pendoley Environmental Pty Ltd for Northwest Resorts Pty Ltd, January 2022.

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YMAC 2019a, Final report regarding the archaeological and ethnographic site identification heritage survey of the proposed Ningaloo Lighthouse Holiday Park expansion undertaken by the Gnulli representatives and Yamatji Marlpa Aboriginal Corporation for Northwest Resorts, Report prepared by the Yamatji Marlpa Aboriginal Corporation for Z1Z Resorts Pty Ltd, December 2019.

YMAC 2019b, Final report regarding the archaeological and ethnographic work program clearance heritage survey of the proposed Ningaloo Lighthouse Holiday Park section 91 water bores undertaken by the Gnulli representatives and Yamatji Marlpa Aboriginal Corporation for Northwest Resorts. Report prepared by the Yamatji Marlpa Aboriginal Corporation for Z1Z Resorts Pty Ltd, December 2019.

WRC 1999. Groundwater Allocation Plan: Exmouth Groundwater Subarea, Water and Rivers Commission, Water Resource Allocation and Planning Series, Report No WRAP 9

# Limitations

**Scope of services**

This report ("the report") has been prepared by JBS&G accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

**Reliance on data**

In preparing the report, JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. JBS&G has also not attempted to determine whether any material matter has been omitted from the data. JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to JBS&G. The making of any assumption does not imply that JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

**Environmental conclusions**

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquiries.

# Appendix A: Ningaloo World Heritage Area National Heritage Place

The following assessment is provided within Section 13.5 of the ERD, as assessed by the State EPA and the DCCEEW ((https://www.epa.wa.gov.au/proposed actions/ningaloo-lighthouse-resort-project).

**World Heritage Properties with National Heritage Values**
The Ningaloo Coast World Heritage Area and National Heritage Place cover the same geographical area. The proposed action lies within terrestrial boundary of the coastal area of the Ningaloo Coast World Heritage Area and within the mapped boundary of the National Heritage Place.

### Ningaloo Coast World Heritage Area

The Ningaloo Coast was inscribed on the World Heritage list in June 2011, meeting criteria for Outstanding Universal Value. The boundary encompasses what the World Heritage Committee considered to be the Ningaloo Coast's key marine and terrestrial values of outstanding universal value and excludes all areas under pastoral lease.

The interconnected ocean and arid coast form aesthetically striking landscapes and seascapes. The coastal waters host a major near shore reef system and a directly adjacent limestone karst system and associated habitats and species along an arid coastline. The property holds a high level of terrestrial species endemism and high marine species diversity and abundance.

The most dominant marine habitat is the Ningaloo reef, which sustains both tropical and temperate marine fauna and flora, including marine reptiles and mammals, and an unusual diversity of marine turtle species with an estimated 10,000 nests deposited along the coast annually.

The main terrestrial feature of the Ningaloo Coast is the extensive karst system and network of underground caves and water courses of the Cape Range. The karst system includes hundreds of separate features such as caves, dolines and subterranean water bodies and supports a rich diversity of highly specialized subterranean species. Above ground, the Cape Range Peninsula belongs to an arid ecoregion recognized for its high levels of species richness and endemism, particularly for birds and reptiles (DAWE 2021).

The third IUCN World Heritage Conservation Outlook for the Ningaloo Coast in 2020, has downgraded the rating from ‘Good’ to ‘Good with some concerns’ (IUCN 2021). The analysis identifies climate change as the leading reason for this reclassification and highlights a number of other major threats to Ningaloo including those posed by oil and gas and coastal development, as well as fishing effort.

Increasing visitation, recreational use and associated pressures on marine, coastal and terrestrial habitats within and adjacent to the site continue as major threats. Unmanaged visitor access, visitor recreation activities and introduced plants and animals continue to remain major threats to the World Heritage property.

**Ningaloo Coast National Heritage Listing**

In addition to its World Heritage listing Section 2.6.5), the Ningaloo Coast is considered to have outstanding heritage value to the nation and has been included in the Australian National Heritage List (DAWE 2021). Due to its extraordinary natural qualities and Indigenous significance, the Ningaloo Coast is considered to meet the following criteria (CoA 2010) for a place having outstanding heritage value to the nation because of the place’s:

- importance in the course, or pattern, of Australia's natural or cultural history;

- possession of uncommon, rare or endangered aspects of Australia's natural or cultural history;
- potential to yield information that will contribute to an understanding of Australia's natural or cultural history;
- importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments; and
- importance in demonstrating a high degree of creative or technical achievement at a particular period.

In the context of this proposed action, the Natural Values include (CoA 2010):

- The Biogeographical environment being "a story of Australia during the Neogene period (beginning about 25 million years ago) is a story of increasing post-Gondwanan isolation and the expansion of aridity. The subterranean faunas and rangeland communities of Exmouth Peninsula exemplify both these evolutionary drivers and accentuate the intimate ties between ecology and geological history more vividly than any other place in Australia."
- The Exmouth Peninsula subterranean estuary which "has outstanding heritage value to the nation for supporting the most diverse and the richest anchialine and groundwater fauna in Australia, among the richest in the world. These ecosystems and the troglobites and stygofauna they support have the potential to yield information about biogeography, evolution and changing climates in Australia over hundreds of millions of years, from the late Palaeozoic to the present."

The Indigenous Values (CoA 2010) include consideration of the archaeological deposits in the rock shelters on Cape Range which "show Aboriginal peoples' sophisticated knowledge of marine resources between 35,000 and 17,000 years ago. Shell beads discovered at Cape Range have been dated to more than 32,000 years old, which is the earliest evidence known in Australia for the manufacture of personal ornaments." The rock shelters of Exmouth Peninsula provide the best evidence in Australia for the use of marine resources during the Pleistocene including their uses as food and for personal adornment.

Whilst the proposed action will not impact on rock shelters, it is possible that archaeological deposits have been washed down from the Cape Range over time and may be discovered at the base of the range, as is considered may be the case for the newly identified Aboriginal heritage site near the proposed action's new borefield access track.

The Indigenous values of the Ningaloo Coast National Heritage Place are not definitively mapped. Indigenous people are the primary source of information on the value of their heritage and should be consulted on a proposed action likely to significantly impact on the listed Indigenous heritage values of the place and/or on a protected matter that has Indigenous heritage values (like listed threatened species).

An action is likely to have a significant impact on the World Heritage values of a declared World Heritage property if there is a real chance or possibility that it will cause:

- one or more of the World Heritage values to be lost;
- one or more of the World Heritage values to be degraded or damaged; or
- one or more of the World Heritage values to be notably altered, modified, obscured or diminished.
- The results of an assessment completed with reference to the EPBC significance criteria for both listings are presented in Table  and Table 13-9

This assessment takes into consideration the UNESCO World Heritage listing criteria for Ningaloo Coast and the EPBC Act gazetted Criteria and Values for the National Heritage Listing.

**Table A1: Significant impact criteria for Ningaloo Coast World Heritage and National Heritage Listed Place**

| World Heritage Criterion | Potential impacts | Assessment of Impacts, Avoidance, Mitigation and Management Measures |
|---|---|---|
| (vii) The landscapes and seascapes of the property are comprised of mostly intact and large-scale marine, coastal and terrestrial environments. The lush and colourful underwater scenery provides a stark and spectacular contrast with the arid and rugged land. | Clearing of native vegetation | The proposed action requires the clearing of 3.98 ha of native vegetation, within an existing tourist facility in an area zoned for zoned for tourist development under the Shire of Exmouth's Local Planning Scheme.<br><br>No TECs or EPBC Act-listed Threatened Flora have been recorded in the proposed action area.<br><br>The vegetation to be cleared represents a loss of<br>• 3.28 ha of Dune swale habitat. Coastal dune habitats are widespread along the coastline, and not restricted in extent. This habitat type is represented in nearby Conservation estate.<br>• 0.70 ha of Rocky hills and slope habitat. The limestone Cape Range provides the most prominent habitat types within the survey area and is also represented in the Cape Range National Park.<br>• The loss of 0.002 ha of Sheltered Gullies and Minor Caves habitat associated with an existing walking track. This habitat type is well represented within the Cape Range National Park and surrounding areas of Cape Range.<br><br>The minor extent of vegetation and habitat loss within an existing developed site, is not considered significant with respect to the World Heritage values of the adjacent landscape. |
| | Direct impact of visual change to landscape as a result of the new resort buildings and irrigated landscape. | The proposed resort is designed to be low impact and blend into the natural environment through use of building materials, existing landforms to preserve current views (especially from the Lighthouse) and landscaping. Revegetation will utilising native grassland and shrub mixes and sparse trees, to mimic the surrounding hummock grassland and dune vegetation found currently surrounding the site. The potential to successfully transplant mature trees is currently being investigated.<br><br>Irrigation of landscaped areas will be undertaken using treated wastewater, primarily on grassed open spaces and garden beds. Much of the native vegetation will not require irrigation. The visual impact of "green" of grassed areas will be managed by interspersing these areas within the built form, rather than large open "oval" type expanses.<br><br>The design and selection of materials for the carpark and roads is yet to be finalised, with a number of factors being incorporated into the final design, such as noise reduction, visual amenity and colour to minimise heat reflection. At this stage it is anticipated that high traffic areas will likely be smooth graded red asphalt designed to mimic the red pindan sands, and minor tracks to be stabilised with crushed roadbase in similar colour to natural ground surface.<br><br>The proposed resort represents a positive impact on the visual landscape, compared to the current 30 year old resort, which is largely run-down and landscaped with introduced species. The following plates demonstrate the likely impact of the proposed resort compared to the existing approved development.<br><br>  <br>**Plate 13-2: Existing resort site (MP Rogers 2019)**<br><br>  <br>**Plate 13-3: Architectural Render of Design (Kerry Hill Architects 2019)** |
| (x) On the ecotone, between tropical and temperate waters, the Ningaloo Coast hosts an unusual diversity of marine turtle species with an estimated 10,000 nests deposited along the coast annually. | Indirect impact of lighting from the proposed action on turtle nesting and hatchling behaviour on the adjacent beach. | There is a pathway for light pollution from the proposed action to decrease the quality of nesting habitat. If uncontrolled, night-time lighting could lead to disorientation of hatchling turtles on the beach which could result in consistent annual mortality and, in the long-term, a potential decrease in |

| World Heritage Criterion | Potential impacts | Assessment of Impacts, Avoidance, Mitigation and Management Measures |
|---|---|---|
| | Indirect impact of tourists from the resort interacting with marine turtles at the adjacent nesting beach. | the overall size of the population.<br><br>However, lighting design for the proposed action will be based around Best Practice Lighting Principles which will reduce the light emissions to as low as reasonably practicable. The Proponent's Artificial Light Assessment and Artificial Light Management Plan (ALMP) contains control measures within which aim to ensure no direct light is detected at nesting beaches and skyglow will be minimised.<br><br>Annual monitoring of turtle nesting and hatchling behaviour will be undertaken and should changes be detected before and after construction, and throughout operation, adaptive management will identify and rectify changes to nesting habitat so that the marine turtle populations are not impacted.<br><br>Similarly, with the implementation of the proposed control measures, the impact of light pollution on nesting and hatchling emergence behaviour is unlikely to significantly affect the marine turtle populations in the long term. Furthermore, the implementation of monitoring and adaptive management will prevent long term impacts on nesting and hatchling emergence behaviour. Accordingly, the proposed action is not expected to interfere with the recovery of the genetic stocks and will not therefore diminish the World Heritage values associated with marine turtles.<br><br>The implementation of the proposed action will result in an improved outcome with respect to access to the beach in front of the resort, assisting in limiting uncontrolled access and controlling night lighting of the access, through dunes and onto the nesting beach. There is also the opportunity to assist in education of visitors to the Resort regarding the conservation values of both the immediate and broader surrounding. |
| (x) The majority of subterranean species on land, including aquatic species in the flooded caves are rare, taxonomically diverse and not found elsewhere in the southern hemisphere. The combination of relict rainforest fauna and small fully aquatic invertebrates within the same cave system is exceptional. The subterranean fauna of the Peninsula is highly diverse and has the highest cave fauna (troglomorphic) diversity in Australia and one of the highest in the world. | Abstraction of groundwater and irrigation of treated wastewater may impact on the groundwater habitat values for subterranean fauna. | In contrast to the rich stygofauna community found more generally on the Peninsula, the new borefield appears to contain a depauperate stygofauna despite quite intensive sampling. It contains probably four species of stygofauna compared with 77 now known from the Peninsula, although there was greater taxonomic effort applied to the borefield survey than across most surveyed parts of the Peninsula. The other 11 species collected during the survey were in areas outside the borefield.<br><br>Thirty species were collected in a similar-sized survey at Exmouth with similar taxonomic effort to that of the borefield survey. The crustacean's species that characterise the stygofauna of the Peninsula and support most taxonomic interest is largely absent from the borefield.<br><br>The low number of stygofauna species in the borefield is probably the result of the watertable in the borefield being deep (30-50 mbgl) and the borefield aquifer being in Tulki limestone that consists mostly of weakly cemented sand, rather than containing caverns (Bennelongia 2020).<br><br>The proposed groundwater abstraction will result in a potential reduction of stygofauna habitat in the order of 0.5% as a result of drawdown. Salinity impacts are likely to be seasonal and limited to existing salinity ranges in which stygofauna in the vicinity of the proposed action are known to occur.<br><br>The proposed action will result in irrigation of treated wastewater with a concentration of nitrogen as nitrate concentration of <6 mg/L. The Nitrogen will pass through to the water table except to the extent it is taken up by plant roots, resulting in a discharge to the groundwater substantially lower than around the old Exmouth WWTP. A survey of stygofauna occurrence in relation to nutrient levels at the old Exmouth WWTP suggested that nitrogen concentrations had little effect, if any, on stygofauna at concentrations of 15 mg/L.<br><br>The listed stygofauna species that may occur in the borefield all have wide ranges on the Peninsula, and it is unlikely that any species would have a range restricted to the vicinity of the borefield.<br><br>Overall, the effect of groundwater abstraction and treated wastewater irrigation on subterranean fauna conservation values is considered to be low with no predicted potential significant residual impact. |
| (x) Above ground, the diversity of reptiles and vascular plants in the drylands is likewise noteworthy. | Clearing of native vegetation may impact on vascular plants and habitat for reptiles. | The proposed action requires the clearing of 3.98 ha of native vegetation, within an existing tourist facility in an area zoned for zoned for tourist development under the Shire of Exmouth's Local Planning Scheme.<br><br>No TECs or EPBC Act-listed Threatened Flora have been recorded in the proposed action area.<br><br>The vegetation to be cleared represents a loss of<br><br>• 3.28 ha of Dune swale habitat. Coastal dune habitats are widespread along the coastline, and not restricted in extent. This habitat type is represented in nearby Conservation estate.<br>• 0.70 ha of Rocky hills and slope habitat. The limestone Cape Range provides the most prominent habitat types within the survey area and is |

| World Heritage Criterion | Potential impacts | Assessment of Impacts, Avoidance, Mitigation and Management Measures |
|---|---|---|
| | | also represented in the Cape Range National Park.<br>• The loss of 0.002 ha of Sheltered Gullies and Minor Caves habitat associated with an existing walking track. This habitat type is well represented within the Cape Range National Park and surrounding areas of Cape Range.<br><br>No threatened fauna are known to occur within or close to the proposed action area and none were identified during the field survey.<br><br>Twelve reptiles were recorded during the field survey, only one of which was of State conservation significance: *Lerista allochira* (Cape Range Slider, P3). This species is known only from the North West Cape Peninsula, inhabiting a known range of approximately 70 km north-south and 20 km east-west. All habitat types provided suitable areas for various reptile species.<br><br>The minor extent of vegetation and habitat loss within an existing developed site, is considered of minor extent and is unlikely to result in changes to the World Heritage values of the adjacent landscape. |

**Table A2: Significant Impact Criteria National Heritage Place**

| National Heritage Criterion | National Heritage Values | Potential Impacts to Values | Avoidance, Mitigation and Management Measures and Predicted Outcome |
|---|---|---|---|
| (a) the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history.<br><br>(c) the place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.<br><br>(d) the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of:<br>(i) a class of Australia's natural or cultural places; or<br>(ii) a class of Australia's natural or cultural environments. | **Natural Values**<br>The Exmouth Peninsula subterranean estuary and associated subterranean fauna (stygofauna and troglofaunal)<br><br>The integration of the Ningaloo Reef and Exmouth Peninsula karst system as a cohesive limestone structure is at the heart of the natural heritage significance of the Ningaloo Coast. | Groundwater abstraction resulting in lowered groundwater table, including potential impacts to subterranean fauna habitat.<br><br>Increased salinity of groundwater as a result of abstraction.<br><br>Reduced groundwater quality, as a result of infiltration of contaminants from treated wastewater irrigation and fuel storage and vehicle fuel station or contaminated stormwater runoff. | In contrast to the rich stygofauna community found more generally on the Peninsula, the new borefield appears to contain a depauperate stygofauna despite quite intensive sampling. It contains probably four species of stygofauna compared with 77 now known from the Peninsula, although there was greater taxonomic effort applied to the borefield survey than across most surveyed parts of the Peninsula. The other 11 species collected during the survey were in areas outside the borefield.<br><br>Thirty species were collected in a similar-sized survey at Exmouth with similar taxonomic effort to that of the borefield survey. The crustacean species that characterise the stygofauna of the Peninsula and support most taxonomic interest are largely absent from the borefield.<br><br>The low number of stygofauna species in the borefield is probably the result of the watertable in the borefield being deep (30-50 mbgl) and the borefield aquifer being in Tulki limestone that consists mostly of weakly cemented sand, rather than containing caverns (Bennelongia 2020)<br>.<br>The proposed groundwater abstraction will result in a potential reduction of stygofauna habitat in the order of 0.5% as a result of drawdown. Salinity impacts are likely to be seasonal and limited to existing salinity ranges in which stygofauna in the vicinity of the proposed action are known to occur.<br><br>Chemical and fuels to be stored in accordance with appropriate Australian Standards and refuelling activities will be undertaken on hardstand areas, where contaminated runoff is collected for subsequent treatment and disposal.<br><br>The proposed action will result in irrigation of treated wastewater with a concentration of nitrogen as nitrate concentration of <6 mg/L. The Nitrogen will pass through to the water table except to the extent it is taken up by plant roots, resulting in a discharge to the groundwater substantially lower than around the old Exmouth WWTP. A survey of stygofauna occurrence in relation to nutrient levels at the old Exmouth WWTP suggested that nitrogen concentrations had little effect, if any, on stygofauna at concentrations of 15 mg/L.<br><br>The listed stygofauna species that may occur in the borefield all have wide ranges on the Peninsula, and it is unlikely that any species would have a range restricted to the vicinity of the borefield.<br><br>Overall, the effect of groundwater abstraction and treated wastewater irrigation on subterranean fauna conservation values is considered to be low with no predicted potential significant residual impact. |
| (a) the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history. | **Natural Values**<br>Rangeland communities of Exmouth Peninsula | Clearing of up to 3.98 ha of native vegetation and associated terrestrial faunal habitat.<br><br>Direct loss of fauna or SRE individuals through impacts resulting from ground disturbance and machinery or vehicle movements.<br><br>Indirect impacts to adjacent native vegetation, resulting in habitat loss, degradation and fragmentation, as a result of the spread of invasive species (weeds).<br><br>Invasive species predation on, and competition with, native species and destruction of habitat.<br><br>Increasing and unmanaged visitation and associated pressures coastal and terrestrial habitats. | The proposed action requires the clearing of 3.98 ha of native vegetation, within an existing tourist facility in an area zoned for zoned for tourist development under the Shire of Exmouth's Local Planning Scheme.<br><br>No TECs or EPBC Act-listed Threatened Flora have been recorded in the proposed action area.<br><br>The vegetation to be cleared represents a loss of<br>3.28 ha of Dune swale habitat. Coastal dune habitats are widespread along the coastline, and not restricted in extent. This habitat type is represented in nearby Conservation estate.<br><br>0.70 ha of Rocky hills and slope habitat. The limestone Cape Range provides the most prominent habitat types within the survey area and is also represented in the Cape Range National Park.<br><br>The loss of 0.002 ha of Sheltered Gullies and Minor Caves habitat associated with an existing walking track. This habitat type is well represented within the Cape Range National Park and surrounding areas of Cape Range.<br><br>The minor extent of vegetation and habitat loss within an existing developed site, is not considered significant with |

| National Heritage Criterion | National Heritage Values | Potential Impacts to Values | Avoidance, Mitigation and Management Measures and Predicted Outcome |
|---|---|---|---|
| | | | respect to the World Heritage values of the adjacent landscape.<br>Active pest and weed management will be undertaken with the proposed action area.<br>Visitor access through dunes adjacent to the proposed action to be managed by designing the foreshore access track as a formal pathway to discourage access through the coastal dunes.<br><br>Revegetation of cleared and degraded areas will occur through landscaping around the development, utilising native grassland and shrub mixes and sparse trees, to mimic the surrounding hummock grassland and dune vegetation found currently surrounding the site<br><br>The extent of disturbance tot native vegetation is minor and is not anticipated to result in significant impacts to the Natural heritage values of the National Heritage listing of Ningaloo Coast. |
| (b) the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history | **Natural Values**<br>This criterion specifically relates to the Bundera Sinkhole and the associated karst system that contributes to the understanding of Australia's natural history. | There is potential for groundwater abstraction to impact on values of the underlying karst systems. | The wider Exmouth Peninsula supports a stygofauna-based Threatened Ecological Community (i.e., the Cape Range Remipede Community at Bundera Sinkhole on the west coast) and the nationally important subterranean aquifer system Cape Range Subterranean Waterways (WA006) (Lane *et al*. 2001 in Bennelongia 2021). However, the proposed action is not within close proximity of the Bundara Sinkhole and is located approximately 4 to 5 km from the Cape Range Subterranean Waterways.<br><br>Furthermore, the borefield aquifer is located within Tulki limestone that consists mostly of weakly cemented sand, rather than containing caverns (Bennelongia 2020).<br><br>No impact to the values of the Bundera Sinkhole or the Cape Range Subterranean Waterways is anticipated as a result of the proposed action. |
| (a) the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history.<br><br>(c) the place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history<br><br>(f) the place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period. | **Indigenous Values**<br>Archaeological deposits within Cape Range<br><br>Consultation with Indigenous stakeholders on a proposed action likely to significantly impact on the listed Indigenous heritage values of the place and/or on a protected matter that has Indigenous heritage values. | Ground disturbance within the impact zone of Registered Aboriginal heritage site, Vlamingh Head (DPLH ID 10381- ceremonial).<br><br>Increasing and unmanaged visitation impacting on Registered and newly identified Aboriginal heritage sites. | The proposed action will result in ground disturbance within the impact zone of the Vlamingh Head Registered Heritage site, in accordance with the conditions of the AH Act (WA) s18 consent (Reference: 69-21438).<br><br>The proposed action has identified two previously unknown sites which will be afforded ongoing protection as a result of the implementation of the proposed action:<br>*Sensitive Dune Area*; and<br>*Section 91 Water Bores Avoidance Area One*.<br><br>The proposed disturbance is limited to an existing disturbed area within the Registered Aboriginal heritage site on Lot 2 and is not likely to be significant at either a local or regional scale.<br>Void<br><br>The *Sensitive Dune Area* site within Lot 557 will be avoided and will not be impacted by the proposed action. Tourists will be encouraged away from the landform with use of alternative pathways.<br><br>The *Section 91 Water Bores Avoidance Area One* site will be avoided by deviation of the access track to the east. The old track will be blocked to prevent further vehicle access. As the new alignment of the borefield access track becomes the preferred track then the sand plain and vegetation should reclaim the area of the site that is within the track<br><br>The proposed action's Cultural Heritage Management Plan will be implemented that includes ongoing communication with Aboriginal stakeholders. |

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## Appendix B Management forms

**Table A.1: Incident and Complaints Register**

| Date received: | Incident/ Complaint Type: | Reported by: | Nature of incident/complaint | Date of investigation | Outcome | Date raised in pre- start |
|---|---|---|---|---|---|---|
| *15/5/2019* | *Incident – Environmental (example)* | *John Doe/ Operator* | *Diesel spill*<br>*Hose burst causing ~15L of diesel to be released to the ground* | *15/5/2019* | *Soil was removed and placed in a bag from spill kit. To be removed off site*<br>*HV was inspected. Hose not able to be replaced on site so sent off site for repair.* | *16/5/2019* |
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**Table A.2: Vegetation Clearing Register**

| Date | Operator | Area cleared ($m^2$) and location (with coordinates) | Within footprint | Comments (include instances of fauna observations and removal) |
|---|---|---|---|---|
| *30/06/19* | *J. Doe* | *700 $m^2$* | *Yes* | *4 marked trees removed* |
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**Table A.3: Weed and Hygiene Inspection Register**

| Vehicle Status (tick as appropriate) | Leaving | Entering | Relocating | |
|---|---|---|---|---|
| **Name of inspector:** | | | | |
| **Date:** | | | **Project Area:** | |
| **Machinery/Equipment/Vehicle Type:** | | | **Vehicle # / Registration:** | |
| **Location of last works undertaken by equipment:** | | | | |

| Aspects | Yes | No | Comments |
|---|---|---|---|
| Heavy build-up of dirt? | ☐ | ☐ | |
| Presence of plant material? | ☐ | ☐ | |
| Does the vehicle need cleaning to remove dirt and/or plant material | ☐ | ☐ | Circle measures used to clean down vehicle/machinery:<br>Dry brush Down Wash Down High Pressure Wash |

**Table A.4: Environmental Inspection Form**

DATE: _____ INSPECTED BY: _____

| Inspection Items | YES | NO | NA | Comments/Recommendations |
|---|---|---|---|---|
| **General items** | | | | |
| Have all actions raised in the previous inspections been closed out? | ☐ | ☐ | ☐ | |
| Have all actions from any recent environmental incidents been adequately investigated and appropriately addressed? | ☐ | ☐ | ☐ | |
| **Access and Security** | | | | |
| Are fences intact with no sign of damage or forced entry? | ☐ | ☐ | ☐ | |
| Is signage available and intact for personnel and the public? | ☐ | ☐ | ☐ | |
| **Dust management** | | | | |
| Is the work area free from excessive visible dust? | ☐ | ☐ | ☐ | |
| Are vehicles using designated tracks, access roads? | ☐ | ☐ | ☐ | |
| Is dust suppression of dirt roads and other cleared areas being undertaken? | ☐ | ☐ | ☐ | |
| Is water used for dust suppression from fresh source? (ie not saline) | ☐ | ☐ | ☐ | |
| **Clearing and Ground Disturbance Management** | | | | |
| Are Aboriginal or other Heritage sites appropriately flagged or otherwise demarcated to prevent accidental access? | ☐ | ☐ | ☐ | |
| Have clearing activities been contained within mapped disturbance footprint limits? | | | | |
| Are records of clearing (dates and area cleared) available? | ☐ | ☐ | ☐ | |
| Are stockpiles of cleared vegetation or soil located within the boundary of the project area, within existing cleared areas? | ☐ | ☐ | ☐ | |
| **Fauna Management** | | | | |
| Is there evidence of fauna being fed on site? | ☐ | ☐ | ☐ | |
| Is there signage indicating limited speed on site? | ☐ | ☐ | ☐ | |
| Is egress available in open excavations | ☐ | ☐ | ☐ | |
| Are trenches checked at start and finish of shift? (Record times of inspection) | ☐ | ☐ | ☐ | Start Time:<br>Finish Time: |
| Have any fauna injury or deaths been observed or recorded or reported to site supervisor? | ☐ | ☐ | ☐ | |
| Is there evidence of feral pests (e.g. rabbits ,foxes, cats) | ☐ | ☐ | ☐ | Note: record any control measures undertaken: |
| **Weed and Dieback Management** | | | | |
| Have vehicle hygiene inspections been conducted on plant and light vehicles? | ☐ | ☐ | ☐ | |
| Is there any sign of increased weed levels within retained vegetation? | ☐ | ☐ | ☐ | |
| Is there visible evidence of weed spread beyond the site boundary into the adjacent native vegetation? | ☐ | ☐ | ☐ | |
| Are the locations of weeds within the disturbance footprint clearly demarcated (e.g. using flagging) | ☐ | ☐ | ☐ | |
| Has weed contaminated soil and/or vegetative material been separately stockpiled and signed? | ☐ | ☐ | ☐ | |
| **Waste Management** | | | | |
| Is the work area free from waste, including cigarette butts and windblown litter? | ☐ | ☐ | ☐ | |

| Inspection Items | YES | NO | NA | Comments/Recommendations |
|---|---|---|---|---|
| Do bins have lids and adequate capacity to contain rubbish disposed within them? | ☐ | ☐ | ☐ | |
| Has asbestos waste been removed from site? (waste disposal records will be required) | ☐ | ☐ | ☐ | |
| Is there visible evidence of litter or other waste inappropriately stored or disposed of on-site? | ☐ | ☐ | ☐ | |
| Is there record of wastes removed from the site and disposal location? | ☐ | ☐ | ☐ | |
| **Fire Management** | | | | |
| Are all flammable and combustible materials (e.g. diesel or other fuel) segregated and stored in bunded areas fitted with fire hydrant system (as per AS1940:2017) | ☐ | ☐ | ☐ | |
| **Contractor Demobilisation Management** | | | | |
| Have all site workers and visitors undertaken site induction(s) | ☐ | ☐ | ☐ | |
| Have all construction materials (including ablution blocks, temporary fencing etc.) been removed from site? | | | | |
| Have all construction waste been removed from site? | ☐ | ☐ | ☐ | |
| Are fences intact, secure and padlocked? | ☐ | ☐ | ☐ | |
| Have all actions from environmental incidents been adequately addressed / closed out? | ☐ | ☐ | ☐ | |

**INSPECTION ACTIONS**

| Actions required | Due date | Responsible Person |
|---|---|---|
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