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Technical Report

Eramurra Solar Salt Project: Hatchling Orientation Monitoring and Nesting Habitat Assessment 2024/25

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DISCLAIMER AND LIMITATION

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1. INTRODUCTION

1.1 Project Description

Leichhardt Salt Pty Ltd (LEIC) is the Proponent for the Eramurra Solar Salt Project (hereafter the Project), a solar salt operation east of Cape Preston, approximately 55 km west-southwest of Karratha in the Pilbara region of Western Australia.

The Project will utilise seawater and natural solar evaporation processes to produce a concentrated salt product. The annual average production capacity is 5.2 Million tonnes per annum (Mtpa) with 6.8 Mtpa in a low rainfall year.

1.2 Scope Context

LEIC have previously undertaken marine turtle monitoring during two seasons in 2022/23 and 2023/24 to capture data for inclusion within Project approval documentation. These included nesting and hatching surveys designed to align with the requirements of the *National Light Pollution Guidelines for Wildlife* (the guidelines; DCCEEW 2023). During each season, three two-week surveys were undertaken across the peak nesting and hatching periods for hawksbill, flatback, and green turtles, targeting potential habitat within 20 km of the proposed Project footprint.

During the review of the Project's Environmental Review Document, the Department of Climate Change, Energy, the Environment and Water (DCCEEW) noted the omission of a ~2.5 km section of potential nesting habitat on the mainland, referred to as 'T3' in O2 Marine (2022) (see **Figure 1**). This section, located west of 40 Mile Beach, had previously shown very low overnight nesting activity, with just one fresh track recorded over four days.

1.3 Scope of Work and Objectives

In response to the DCCEEW review, and acknowledging the potential visibility of Project lighting from ~9 km away, LEIC engaged Nocterra to conduct a baseline hatchling orientation monitoring survey at T3 during the peak flatback turtle hatching season in 2024/25. The primary objective was to collect baseline data on hatchling orientation to provide additional context of potential light-related impacts on hatchling behaviour in the area. In addition, while the survey was scheduled outside the peak nesting season, it also aimed to assess the suitability of the beach habitat to support adult turtle nesting activity.

This report presents the findings of the hatchling orientation survey and the adult turtle nesting habitat assessment conducted along the T3 beach section.

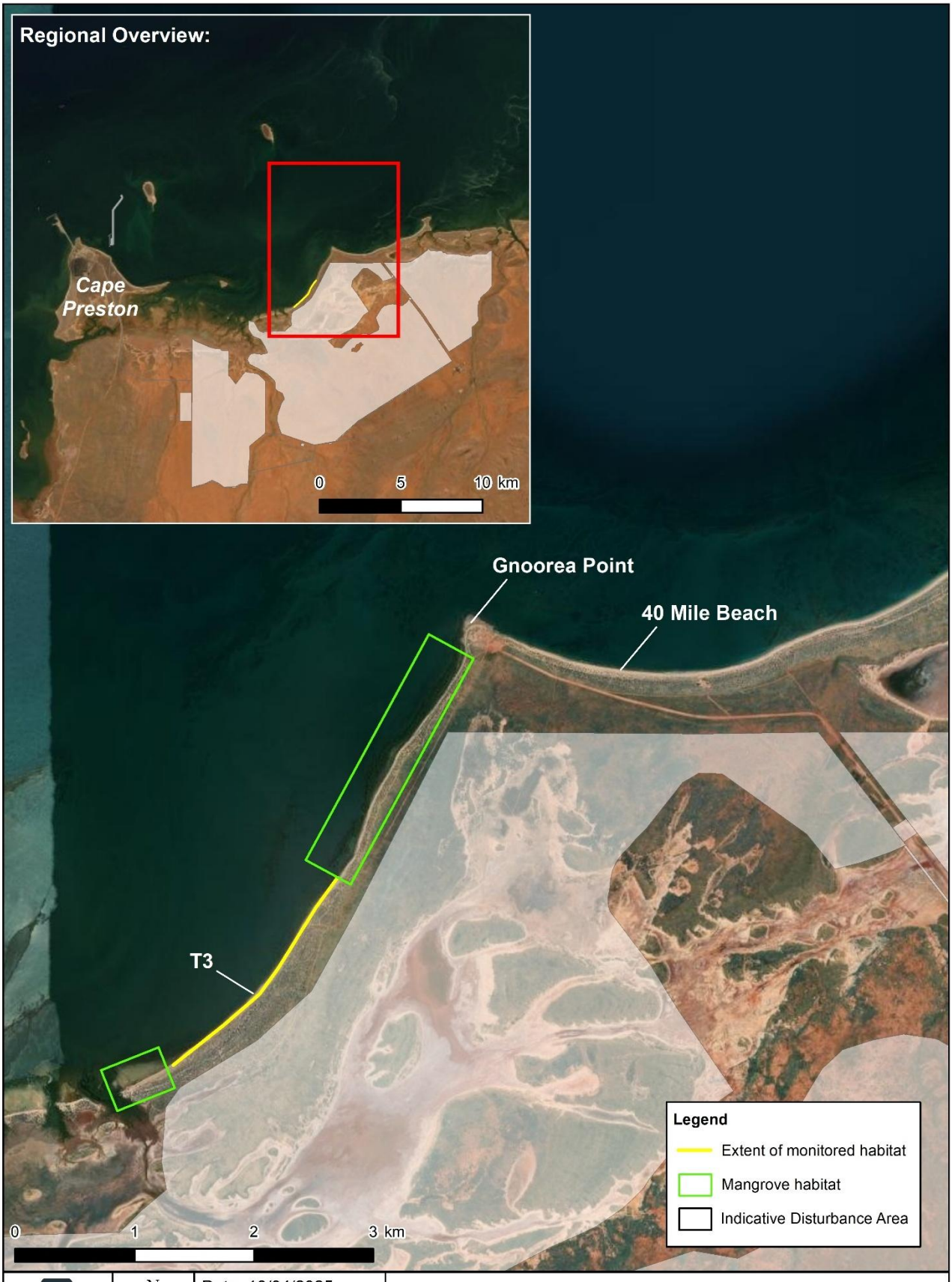

Figure 1: Location map.

2. METHODOLOGY

2.1 Survey Location and Schedule

The hatchling orientation survey was conducted daily over a period of 15-days between 21st February and 7th March 2025. The survey was scheduled to align with the peak flatback turtle hatching season for the region (February to March; Commonwealth of Australia 2017) and a new-moon period (new moon = 28th February 2025).

Suitable sandy beach habitat was surveyed along the T3 section, located approximately 2 km southwest of 40 Mile Beach (see **Figure 1**). The monitored area extended 2.3 km from the western boundary (latitude -20.874610, longitude 116.319866) to the eastern boundary (latitude -20.855771, longitude 116.337355). East of this point, the coastline transitions into mangrove habitat extending to Gnoorea Point, with no suitable sandy beach habitat beyond this eastern boundary.

2.2 Hatchling Orientation

2.2.1. Data Collection

The field team patrolled the survey extent above the high-tide line to detect hatchling turtle tracks from recently emerged nests. When tracks were found, they were followed back to their point of origin, typically identified by a surface depression in the sand known as the ‘nest cone’ which is the point from which the hatchling emerged.

If more than five hatchling tracks were present, the team recorded bearing measurements of the fan of tracks using a sighting compass (see **Figure 2**). Bearings were taken from the emergence point to where the tracks crossed the high tide line on a flat beach surface (removes variation caused by undulating nesting landscapes i.e. from body pits made by nesting turtles), or at a distance of 5 m from the nest, whichever was greater. Measurements included the bearings of the two outermost tracks that formed the outside arms of the fan, as well as the most direct path to the ocean.

2.2.2. Data Analysis

Offset and spread angles were calculated for bearings measured from each nest to determine the following:

- **Spread Angle:** The range of dispersion of hatchling tracks from the emergence point towards the ocean. A larger value indicates greater variation in ocean finding bearings and may indicate disruption to natural hatchling sea finding ability.
- **Offset Angle:** The degree of deflection of hatchling tracks from the most direct route to the ocean. A smaller value indicates a more direct route, and a larger value demonstrates greater deviation from the most direct route which may indicate disruption to natural hatchling sea finding ability.

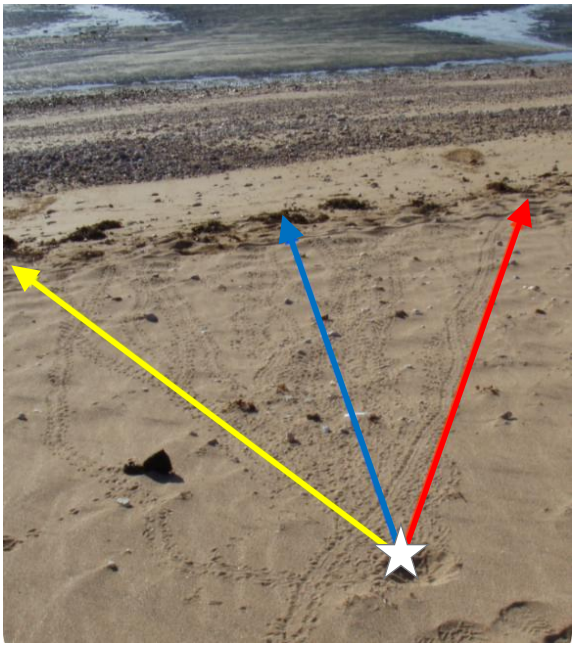

Figure 2: Example of angles measured to assess hatchling orientation. *Red arrow: 'A' angle. Yellow arrow: 'B' angle. Blue arrow: bearing to ocean. White star: emergence point.*

2.3 Nesting Habitat Assessment

While patrolling the beach habitat, the field team documented the presence of any historical nesting 'craters' as indicated by depressions in the sand formed by nesting adult turtles, often persisting long after tracks have faded. These features can remain visible for extended periods and serve as indicators of past nesting activity.

To support the assessment, the team also captured photographs of the nesting habitat, both on the ground and from the air, using a Phantom 4 Pro Unmanned Aerial Vehicle (UAV).

The assessment considered the presence of any nesting craters alongside key beach characteristics, including sediment type, elevation, beach profile, width, and offshore approach.

3. RESULTS

3.1 Field Conditions

The field survey was completed as planned on the scheduled dates. Conditions during the survey were suitable for the detection of hatchling tracks i.e. there was no rainfall observed by the field team or recorded at the Karratha Weather Station (BoM weather station ID 004083), and field activities were completed early morning each day, prior to the occurrence of any strong wind that could erase tracks.

During the survey period, the height of the high tide increased as the survey progressed, ranging from 3.3 m on 23rd February to a high spring tide height of 5.0 m on 4th March (as per Dampier [King Bay] tide table; BoM 2025).

3.2 Hatchling Orientation

No hatchling tracks or any evidence of past hatching activity were detected at habitat on the T3 beach section during the field survey.

3.3 Nesting Habitat Assessment

The following observations were made that were relevant for the nesting habitat assessment at the T3 beach section during the field survey:

- No adult turtle nesting activity or historic nesting craters were detected across the habitat.
- The beach consists of a sandy substrate bordered at both ends by mangrove habitat (**Figure 3d**).
- The offshore approach includes a flat, expansive intertidal mudflat that becomes exposed at low tide (**Figure 3e**).
- The beach features a shallow nearshore gradient leading up to a steeper, densely vegetated primary dune (**Figure 3a**).
- Elevation varies along the length of the beach, with the eastern part characterised by a higher primary dune ranging from 3 to 6 m from its base, gradually decreasing westward to elevations of around 1 m.
- Evidence of overnight erosion was observed along areas of the beach both before, during, and after the high spring tide on 4th March (see **Figure 3b**). In some areas, this resulted in the tide line extending beyond the vegetation line of the primary dune and the formation of sharply defined beach profiles (**Figure 3c**).
- Depending on the high tide level at the time of the survey, beach widths between the tide line and the vegetation line typically ranged from 3 to 8 m across most of the habitat.
- Vehicle tracks were regularly recorded across the beach habitat (**Figure 3e**).

Figure 3: Nesting habitat observations at the T3 beach section: a. Typical beach profile; b. Steep beach profile caused by high spring tide line; c. High spring tide line extending to the base of the primary dune; d. Mangrove habitat at the eastern end of the habitat; and e. Offshore intertidal mudflat.

4. DISCUSSION

A baseline hatchling orientation survey was conducted over a 15-day period during the peak of the 2024/25 hatching season at the T3 beach section, located southwest of 40 Mile Beach. No hatchling tracks were recorded across the monitored area during the survey period. Additionally, there was no evidence of adult turtle nesting activity, including the presence of historical nesting 'craters'.

The absence of any hatching activity suggests that the habitat was either not used by adult turtles for nesting purposes earlier in the season or did not provide conditions suitable for successful incubation and hatching of any nests that may have been laid.

The limited past monitoring at this beach section undertaken during peak nesting periods supports the conclusion that the habitat experiences very little to no use by adult nesting turtles. For example, in 2020/21, a four-day survey conducted by O2 Marine recorded only a single overnight track (O2 Marine 2022), while an aerial survey conducted by the Department of Biodiversity, Conservation, and Attractions in 2016/17 found no evidence of overnight nesting activity (Fossette et al. 2021).

The suitability of the incubation environment for supporting successful hatching remains uncertain due to the lack of data on the thermal properties of the sand. However, extreme weather associated with Tropical Cyclone Sean, which passed through the region around 19th January 2025, may have significantly impacted any incubating nests laid earlier in the season. On 20th January, the Karratha Weather Station recorded 274 mm of rainfall and wind speeds exceeding 100 km/h. These conditions may have caused inundation of incubating nests or severe erosion, potentially leading to nest failure or complete loss and hence the absence of any hatching during the current survey.

Although the T3 beach section falls within an area of designated critical nesting habitat for flatback, green, and hawksbill turtles, mainland beaches in this region are generally more favourable for flatback turtle nesting, with green and hawksbill turtles typically preferring offshore island habitats. The results of the nesting habitat assessment indicate that much of the T3 beach is unlikely to provide suitable nesting habitat for flatback turtles. In particular, areas adjacent to mangrove habitat and sections where the high tide line extends to the base of the primary dune are considered unsuitable. However, a central portion of the beach, characterised by a wider profile and an elevated primary dune, may offer more favourable habitat for nesting, though the extensive intertidal mudflat offshore may limit turtle access to this area during low tide.

Overall, the absence of any hatchling emergences and evidence of historic adult turtle nesting activity, combined with the outcomes of the nesting habitat assessment, align with past monitoring results and support the conclusion that the T3 beach section likely receives minimal to no seasonal nesting use by marine turtles.

5. REFERENCES

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