

SUNSHINE COAST REGIONAL COUNCIL

ARTIFICIAL LIGHT MANAGEMENT PLAN TEMPLATE FOR DEVELOPERS



Prepared by

Pendoley Environmental Pty Ltd

For

SUNSHINE COAST REGIONAL COUNCIL

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1 INTRODUCTION

1.1 Project Background

The developer should provide 1-2 paragraphs detailing the following information:

- Name of developer, name and type of development and area located in the Sunshine Coast Region.
- Outline the reasons for requiring an Artificial Light Management Plan, for example:

'Due to the proximity of [insert name of development] to the beach, which is known nesting habitat for loggerhead (Caretta caretta) and green turtles (Chelonia mydas), the Sunshine Coast Council have issued a number of Development Approval Conditions specific to the management of artificial light around marine turtles. These conditions form the basis of this Artificial Light Management Plan (ALMP).'

If the proposed development has been referred for formal assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999*, state reason(s) why and the outcomes of the referral. For more information, see:

<https://www.awe.gov.au/environment/epbc/publications/factsheet-submitting-referral-under-epbc-act>

1.2 Site Description

Developer to provide 1-2 paragraphs describing proposed development, including details such as:

- Development location, size of development footprint and proximity to other urban development.
- Number of buildings, number of storeys, total building height above ground, outdoor recreational facilities and communal areas, and commercial tenancies.
- Proximity to turtle nesting habitat, quality of habitat and density of nesting.
- Any other relevant information.

Include locality map showing location of development with respect to turtle nesting habitat.

1.3 Existing Lighting Environment

Developer to provide 1-2 paragraphs describing the existing lighting environment in the vicinity of the development. This may include:

- a description of artificial light sources from nearby commercial and/or residential buildings,
- results of any pre-construction artificial light monitoring surveys undertaken (if applicable),
- results of other artificial light monitoring surveys (i.e. not project related) undertaken in the area, if available.

Note: if there are no artificial light monitoring assessments to be discussed, this section can be combined with the site description. The developer will at a minimum need to provide a description of artificial light sources from nearby commercial and/or residential buildings.

1.4 Aims

This Artificial Light Management Plan has been prepared to address the Sunshine Coast Council's Development Approval Conditions relating to marine turtles for the [insert name of development] (reference conditions). Specifically, the plan:

- Provides background information on the project and existing light pollution.
- Summarises relevant legislation.
- Describes the marine turtle populations of the Sunshine Coast Region.
- Describes the potential risks to marine turtles from the development.
- Describes the proposed lighting design and mitigation measures developed in consultation with the nominated lighting designer.
- Assesses compliance against the Development Approval Conditions.
- Describes the residents' responsibilities.
- Provides an auditing and reporting schedule to ensure compliance against the Development Approval Conditions.

Delete as applicable.

2 ENVIRONMENTAL LEGISLATION

2.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the central Commonwealth legislation protecting nationally significant environmental values across Australia, and is administered by the Department of Agriculture, Water and the Environment. Under this act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the matters of national environmental significance, without approval from the Australian Government. Residential and commercial developments may be classified as an action if the proposed development is likely to have a significant impact on a matter of national environmental significance, such as a species listed as threatened, migratory and/or marine under the EPBC Act.

Six of the world's seven species of marine turtle occur in Queensland waters and are listed as threatened ('endangered' or 'vulnerable'), migratory and marine under the EPBC Act. These species include loggerhead (*Caretta caretta*), olive ridley (*Lepidochelys olivacea*), leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), flatback (*Natator depressus*) and hawksbill (*Eretmochelys imbricata*) turtles. Of these species, loggerhead and green turtles are known to breed at beaches in the Sunshine Coast Region, and are listed as endangered and vulnerable, respectively.

2.2 Nature Conservation Act 1992

The Nature Conservation Act 1992 (NCA) is administered by the Queensland Department of Environment and Science, and provides the legislative basis for the conservation of nature through the declaration and management of protected areas, native wildlife and its habitat. Animals protected under the Act are managed by a legislative framework designed to promote the continuation of viable and sustainable populations in the wild. Similar to the EPBC Act, loggerhead turtles are listed as endangered and green turtles are listed as vulnerable under the NCA.

2.3 International Agreements and Conventions

Green and loggerhead turtles are included on the Red List of Threatened Species of the International Union for the Conservation of Nature (IUCN), of which Australia is a member. The IUCN recognises these species as of global conservation concern. Additionally, Australia is a signatory to a range of international conventions, including:

- the Convention on Biological Diversity (CBD),
- the Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention), and
- the Convention on the Conservation of Migratory Species of Wild Animals (CCMS).

These conventions all advocate for the protection of biological diversity and sustainable use of the natural environment. In particular, the CCMS adopts a Single Species Action Plan (SSAP) for the loggerhead turtle in the South Pacific Ocean. The SSAP provides a framework and actions for the recovery of the loggerhead turtle nesting on Queensland beaches, including those in the Sunshine Coast Council boundaries. Objective 13 of the plan is to 'manage coastal lighting at significant

loggerhead turtle nesting beaches to create a dark coastline', which reflects the main aim of this Artificial Light Management Plan.

3 MARINE TURTLES OF THE SUNSHINE COAST REGION

3.1 Turtle Nesting Activity

The Sunshine Coast comprises a number of turtle nesting beaches between Noosa and Caloundra (**Figure 1**), which are monitored by community groups operating under the Queensland Turtle Conservation Project (Hofmeister et al. 2019). The program, which began in 2005, monitors an almost continuous 97 km stretch of Sunshine Coast nesting beaches, which occur adjacent to urban settings and within National Parks. The region supports a small but important component of the total loggerhead turtle nesting population for eastern Australia, and when combined, the beaches represent a major loggerhead rookery. Lower density nesting by green turtles has also been observed within the region (Hofmeister et al. 2019).

The highest density of loggerhead turtle nesting occurs at Buddina and Shelly beaches (**Figure 1**), with Shelly beach being a designated index beach due to the consistently high monitoring effort applied across all years of the monitoring program from 2007 (Hofmeister et al. 2019). The Recovery Plan for Marine Turtles in Australia identifies the area from Pumicestone Passage to Double Island Point, which encompasses all Sunshine Coast nesting beaches, as 'Habitat Critical to Survival' for the loggerhead turtle (Commonwealth of Australia 2017).

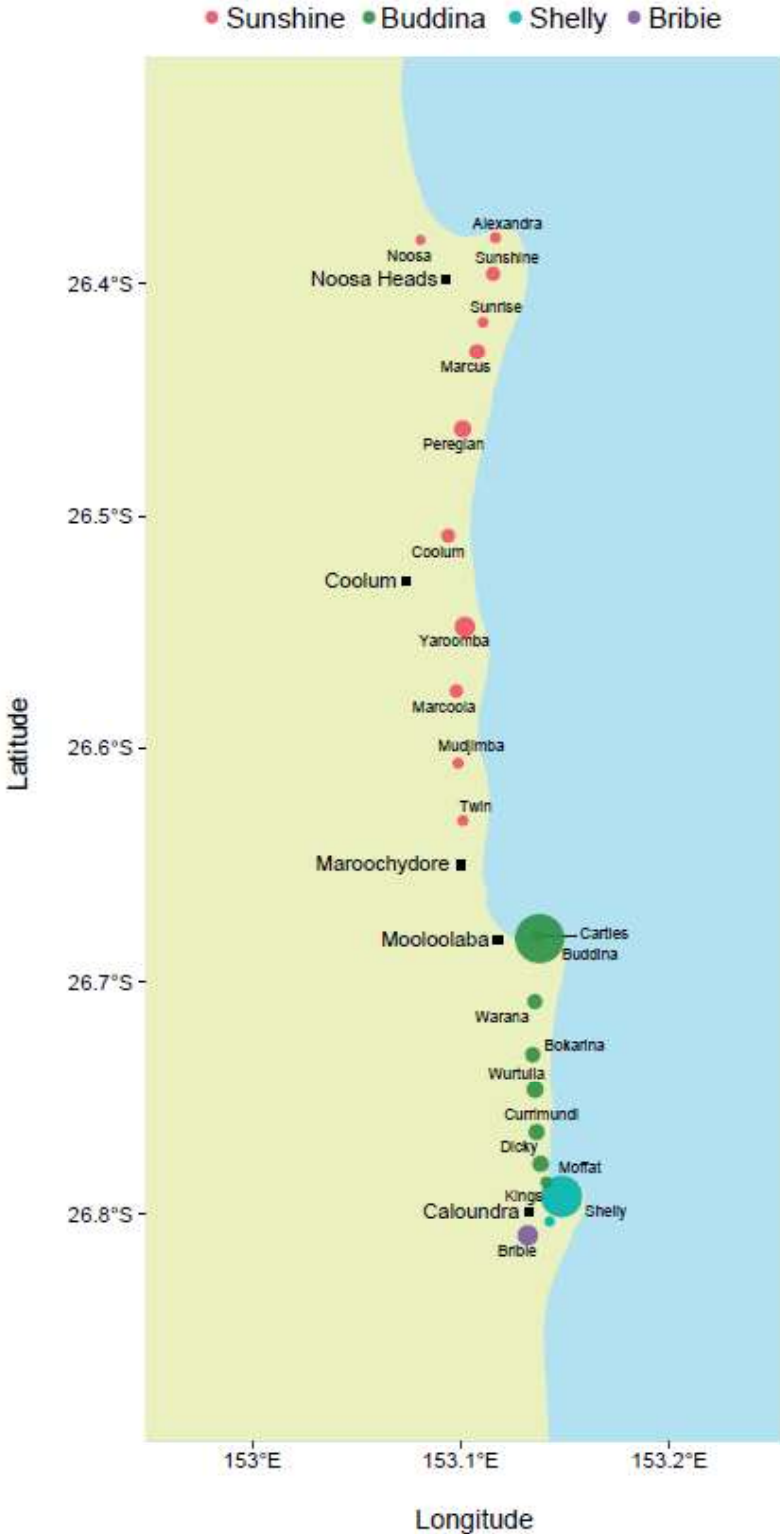


Figure 1: Nesting beaches monitored in the Sunshine Coast region. Dot sizes show relative beach-specific loggerhead nesting abundance recorded since 2009, and dot colour indicates nesting subregion.

3.2 Loggerhead Turtles (*Caretta caretta*)

There are two genetically distinct stocks of loggerhead turtles nesting in Australia, one in Queensland (swPac stock) and one in Western Australia (WA stock) (Commonwealth of Australia 2017). Loggerhead turtles nesting in the Sunshine Coast Region represent approximately 4% of the swPac stock (Hofmeister et al. 2019). This stock is recognised in the Recovery Plan for Marine Turtles in Australia as in 'early stages of decline' due to threats including fisheries bycatch, climate change, marine debris, and light pollution (Commonwealth of Australia 2017).

Monitoring of major rookeries in Queensland has shown that loggerhead turtles experienced an 86% decline in population between 1977 and 2000 (Limpus & Limpus 2003). Similarly, recruitment (measured as the proportion of turtles breeding for the first time) has declined by 50% over the last two decades (Limpus et al. 2019). Historic population decline has largely been attributed to by-catch from trawl fisheries of eastern and northern Australia (Limpus & Reimer 1994). In recent years, recovery of the stock has been recorded, supported by an increased focus on managing key threats to loggerheads.

The mating season for loggerheads of the swPac stock occurs from October to December (peaking in November) and nesting occurs on sandy beaches almost exclusively in Australia and New Caledonia between October and March (peaking in December–January). Loggerhead hatchlings emerge between December and May, with the peak in hatchling emergence occurring between February and March.

3.3 Green Turtles (*Chelonia mydas*)

Green turtles nesting in Australia are distributed across nine genetically distinct stocks, with those nesting in the vicinity of the development being identified as part of the southern Great Barrier Reef (sGBR) genetic stock. Historically, this stock was subject to commercial harvest up until 1959, however it has been recovering well, with good survivorship rates recorded amongst juveniles and adults (Chaloupka & Limpus 2001). Presently, climate change, marine debris and poor water quality due to urban and agricultural run-off are considered the greatest threats to this stock (Commonwealth of Australia 2017).

The Sunshine Coast Region is not considered a major nesting area for green turtles, with only 45 nesting crawls and 35 nests recorded at nesting beaches between Noosa and Caloundra over the 2005–2016 Sunshine Coast monitoring program (Hofmeister et al. 2019). Major nesting areas for the stock occur on the southern islands of the Great Barrier Reef, with Heron, Wreck, North West and Lady Musgrave islands all monitored as index beaches (Commonwealth of Australia 2017). Mating within this stock typically occurs from September to November, nesting from October to April (peaking December–January) and hatching from December to May (peaking February–March) each year (Commonwealth of Australia 2017).

4 RISK ASSESSMENT

4.1 Potential Impacts of Artificial Light on Marine Turtles

Artificial light can alter critical behaviours in marine turtles at different stages in their life cycle, from hatchlings to nesting females (Lohman et al. 1997, Witherington & Martin 2003, Salmon 2003). Disruption to critical behaviours has the potential to impact the population viability of marine turtle species in the long-term, depending on the scale of the impact, and is therefore of conservation concern.

Adult female marine turtles return to land, predominantly at night, to nest on sandy beaches, and rely on visual cues to select nesting habitat and orientate themselves within that habitat. Artificial lighting on or near nesting beaches has been demonstrated to disrupt nesting behaviour, by deterring females from emerging from the water in well-lit areas, and in some cases disorientating females returning to the water (Witherington & Martin 2003). As a result, beaches occurring close to urban development, roadways and other coastal infrastructure often record lower densities of nesting females than beaches set against a naturally dark coastline (Witherington & Martin 2003, Hu et al 2018).

Hatchling turtles typically emerge from the nest at night and must rapidly crawl to the ocean to avoid predation. Hatchlings locate the ocean using a combination of topographic and brightness cues, orientating towards a low, bright oceanic horizon and away from the tall, dark silhouettes of dunes and coastal vegetation (Limpus & Kamrowski 2013, Pendoley & Kamrowski 2015). Artificial light can mask light cues in the natural environment and disrupt hatchling sea-finding behaviour. Hatchlings have been observed to crawl in circuitous paths or away from the ocean on artificially lit beaches, leading to death from predation, exhaustion or dehydration (Witherington & Martin 2003).

Artificial light can also disrupt the dispersal of hatchlings in the nearshore waters of well-lit coastlines. Lights can slow down their in-water dispersal (Wilson et al. 2018), increase the length of their dispersion path, or even attract hatchlings back to shore (Truscott et al. 2017). In addition, artificial lights can increase the visibility of hatchlings to predators, decreasing their chance of survival during dispersion (Pilcher et al. 2000).

4.2 Visibility of [insert development] From Nesting Beaches

Developer to provide 1-2 paragraphs describing visibility of the proposed development from nesting beaches. Considerations include:

- Line of sight from tallest parts of the development over the dunes and/or coastal vegetation
- Presence of buildings between the development and the beach that will provide shielding
- Visibility of the development at points along the coast, not just beaches immediately adjacent.

4.3 Recreational Activities

Expanding coastal development in the region brings an increased number of people to the beach, which has the potential to increase the number of disturbance events during turtle nesting and hatching seasons. In addition, it may result in an increased number of domestic animals that use the beach, which can injure or kill adult and hatchling turtles.

5 LIGHT MANAGEMENT AND MITIGATION

The proposed development will incorporate the Best Practice Lighting Design Principles as outlined in the Commonwealth National Light Pollution Guidelines (Commonwealth of Australia 2020). These Principles are consistent with the globally recognised recommendations of the Australasian Dark Sky Alliance (ADSA 2021) and International Dark Sky Association (IDA 2020) and include:

1. Start with natural darkness and add light only as needed
2. Use adaptive controls to manage lighting (e.g. timers, dimming switches, sensors)
3. Light only intended areas, keep lights close to the ground, directed and shielded
4. Use appropriate lighting for the situation (minimum number and intensity)
5. Use non-reflective, dark coloured surfaces on external finishes
6. Use lights with reduced or filtered out blue, violet and ultraviolet wavelengths

6 DEVELOPMENT APPROVAL CONDITIONS

The Development Approval Conditions issued by the Sunshine Coast Council relevant to marine turtles are provided in **Table 1**. Each condition is listed by number (columns 1 and 2), along with details of how the condition is being addressed (column 3) and whether the condition has been met (column 4).

Table 1: Example marine turtle Development Approval Conditions for [insert development] and assessment of compliance

1 Condition	2 Description	3 Where addressed	4 Assessment of design criteria
1	Construction works are to be restricted to daylight hours during the turtle nesting and hatching season (October to May).	Construction Management Plan, Section 1.	Complies
2	External lighting must comprise of reduced intensity, long wavelength lights.	Lighting Design Report, Section 5.	Complies
3	All windows and glass doors from which the beach is visible must be tinted with non-reflective tinting, or utilise smart glass technology, to block a minimum of 50% of light to reduce light transmission or spill from indoor lighting.	Will be confirmed once glazier has been appointed.	To be confirmed
4	External feature lighting to the building must be positioned below 10 m in height and turned off between 10.00 pm and sunrise during turtle nesting and hatching season (October to May).	N/A	Non-compliant

Developer to fill out Table 2 by listing each development approval condition and filling in columns 3 and 4 as per the example given in the table. Note, there should be no 'non-compliant' assessments in the final document, all conditions must be addressed as either 'complies', or 'to be confirmed' (by exception), with valid justification.

Documents used to address development approval conditions may include (but are not limited to):

- Site plans
- Construction Management Plans
- Community Management Statements
- Lighting design plans, reports and drawings
- Engineering reports
- Lighting product specification sheets
- Schedule of finishes
- Resident information packages (e.g. turtle information package).

If development approval conditions state that certification of the lighting design is required by a tertiary qualified marine turtle biologist, the developer must provide Table 2 and supporting documentation to their nominated turtle biologist. The turtle biologist must consider whether the lighting design meets the conditions set by council, with regards to marine turtles. If it does not, the lighting design must be amended in consultation with the turtle biologist.

7 AUDITING AND ADAPTIVE MANAGEMENT

An annual review of the Body Corporate's commitments to light management and marine turtle education (if applicable) must be undertaken at the start of each turtle nesting season. The review will allow for adaptive management to further mitigate lighting impacts, such as:

- Should biologically relevant light from the development be detected at the beach during post-construction lighting evaluations, additional measures can be undertaken (e.g. screening, shielding or removal) to further reduce or eliminate it.
- Should lights be detected external to the building (e.g. decorative lights or lights that contain short wavelength blue light) that are not in compliance with the DA conditions, actions can be taken to mitigate the non-compliance.

Furthermore, it is recommended that the Body Corporate provide an information package to building occupiers detailing the impacts of light pollution on marine turtles, and the Best Practice Lighting Design Principles. It is important that building occupiers consider the placement, selection, and modification of internal fixtures, such as LED screens, lamps and pendant lighting, to reduce the amount of light visible from turtle nesting beaches.

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