



Department of Planning,  
Lands and Heritage



# Position Statement:

## Dark sky and astrotourism

January 2022

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## 1. Policy intent

This policy details the Western Australian Planning Commission's (WAPC) position on the provision and designation of dark sky locations, and the subdivision and development implications throughout Western Australia. It is intended to be used by all planning decision-makers.

## 2. Dark sky and astrotourism in Western Australia

### 2.1 What is dark sky and astrotourism?

Dark sky is night sky that is free from light and dust pollution to allow astronomical observation. Light pollution often appears as an orange smog which obscures the night sky, as artificial and natural light reflect off moisture and dust particles in the sky.

The concept of astrotourism is integrating tourism opportunities with astronomical observation (both scientific and recreational), photography and the environment.

There are several observatories within Western Australia and their continued operation relies upon a dark night sky, free from light and dust pollution. These observatories contribute to local and international scientific, educational and cultural endeavours, tourism, defence and the economy.

### 2.2 Dark sky principles

The International Dark-Sky Association is the recognised international authority on light pollution, taking the lead in identifying dark sky places and publicising the impacts of artificial light, and promoting several dark sky principles.

These principles are internationally accepted and based on minimising the amount, direction, time and type of artificial lighting that is used. It does not mean that communities must live in darkness, but rather minimise light and dust pollution. The association is also responsible for determining locations with formal dark sky status.

### 2.3 Benefits of dark sky

Applying dark sky principles is generally cost-neutral and can provide environmental and social benefits. This includes benefit from reduced lighting costs and energy consumption, improved safety by removing shadows and glare, enhanced astronomical observation, improved health outcomes from reduced blue light exposure, and greater protection for flora and fauna from the impacts of light pollution.

Western Australia's tourism industry is always seeking to increase visitor numbers and provide a more diverse tourism experience.

Astrotourism is a relatively new and emerging sector in the tourism industry, with widespread opportunities to promote the State's natural assets, including the night sky.

Geographically WA is uniquely placed to offer a combination of activities such as traditional Aboriginal experiences, nature based camping, tours, astro-festivals, star gazing, astrophotography, scientific and educational learning, that are all directly linked to the night sky.

The ability to capitalise on astrotourism through a flexible and responsive planning framework can expand tourism opportunities and support local economies.

## 2.4 Dark sky and wildlife

Scientific studies show that light pollution and sky glow can have indirect and direct physiological and behavioural impacts on our wildlife. Exposure to certain types of artificial light can result in changes to some animals feeding and breeding behaviour, reduced survivorship, and can attract invasive pests or predators.

Preserving dark skies through application of dark sky principles and minimising light pollution can lead to positive outcomes for light sensitive wildlife and complements existing environmental protection frameworks.

Light pollution from subdivision and development proposals may impact on native or threatened species, which are protected under the *Biodiversity Conservation Act 2016* or

the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* for Matters of National Environmental Significance. Decision-makers may refer proposals to the Environmental Protection Authority (EPA), the Department of Biodiversity Conservation and Attraction (DBCA) or the Commonwealth's Department of Agriculture, Water and the Environment (DAWE), and should refer to their *National Light Pollution Guidelines for Wildlife* (as amended) to mitigate potential impacts.

## 3. Application of this policy

This policy applies to planning proposals across Western Australia, including:

- (a) the preparation or assessment of region schemes, regional strategies or frameworks, sub-regional strategies, local planning strategies, schemes and structure plans, or any amendments to these
- (b) subdivision proposals
- (c) development proposals.

This policy does not apply retrospectively to an existing approved use and/ or development, or to development which is exempt under the *Planning and Development (Local Planning Schemes) Regulations 2015* (the Regulations).

However, local governments, households, private organisations and service authorities can use this policy to retrofit or replace existing lighting throughout the State, irrespective of proximity to observatories, to be consistent with the relevant Australian Standards, *Australian Standard 4282:2019 - control of the obtrusive effects of lighting* and the principles listed within this policy.

This policy can also be used to guide individuals who may wish to make a contribution toward achieving dark sky status in their local area.

## 4. Policy objectives

This policy seeks to:

- preserve and protect the night sky for future generations in planned dark sky locations
- minimise light and dust pollution
- establish a set of dark sky principles to be implemented through land use planning mechanisms
- facilitate astrotourism through flexible local planning frameworks.
- minimise the impacts of light pollution on wildlife.

## 5. Policy measures

### Limiting light pollution

The WAPC adopts the following design principles to limit light pollution:

Principle 1: Eliminate light spill

Principle 2: Avoid over-lighting

Principle 3: Use energy-efficient bulbs

Principle 4: Ensure lights are not directed towards reflective surfaces

Principle 5: Use warm white colours

These principles are described in more detail in **Appendix 1**.

### Limiting dust emissions

The WAPC seeks to protect the night sky from the impacts of dust emissions from dust-generating land uses and activities.

### Implementation

Where dark sky considerations are relevant, this policy is to be applied at all stages of the planning process.

### 5.1 Regional, sub-regional strategies and local planning strategies

In its decision-making, the WAPC will require regional, sub-regional and local planning strategies to identify dark sky locations and their purpose and

observatories through indicative buffers or catchment areas, as well as inserting broad objectives to reduce light and dust pollution.

### 5.2 Local planning schemes

In its decision-making, the WAPC may require special control areas to restrict light and dust pollution, to protect dark sky and astrotourism locations.

#### **Special Control Areas**

Special control areas can provide an effective means of maintaining dark sky within 20 kilometres of an observatory. The use of special control areas may be suitable where the night sky requires protection for astrotourism, the environment, wildlife or dark sky-related purposes not connected to an observatory. The size of special control area may be varied to suit the local context.

Special control areas should set out the purpose and objectives, and specific development requirements consistent with this policy. Special control areas may also identify certain uses that may generate significant light and dust pollution as requiring approval or being restricted, or to specify development requirements to manage these impacts. Model special control area provisions are included as **Appendix 2** to this policy.

#### **Land use term/permmissibility**

Dark sky reserves and astrotourism proposals are capable of being considered under 'use not listed' provisions of a scheme. However, if there is a desire to define the land use, the following definition can be used:

***Astrotourism** means premises used for astronomical, commercial, scientific, cultural or environmental tourist activities directly related to the night sky and may include incidental uses such as short-term accommodation.*

In considering proposals for astrotourism, decision-makers will need to:

- ensure any incidental uses relate to the predominant use
- ensure servicing is capable of meeting the needs of the tour groups
- provide adequate carparking
- manage overflow camping and caravan park uses
- ensure appropriate protection and management of environmental values
- any other matter the decision-maker and/or referral authority consider relevant.

### 5.3 District and local structure plans

In its decision-making, the WAPC will require new district and local structure plans to identify locations where dark sky is proposed to be preserved and/or around observatories.

Local structure plans should also establish the intention to apply dark sky principles at subdivision and development stage.

### 5.4 Subdivision

In its decision-making, the WAPC will apply conditions to all subdivision applications where lighting is required, consistent with dark sky principles to achieve a dark sky across the State. Such conditions may relate to roads, pedestrian areas, public open spaces, sports lighting, public infrastructure, or dust generators.

#### **Roads and pedestrian lighting**

Road and pedestrian lighting (street lighting) is necessary to public safety, however measures can be taken to ensure a balance between public safety and the dark sky principles.

The WAPC, in consultation with the relevant road authority, will apply conditions requiring street lighting to comply with the relevant Australian Standards, use the lowest lighting subcategory for the appropriate road category specified in Table 2.1 of

AS1158.1.2:2010 - *Lighting for roads and public spaces*, and comply with the dark sky principles. The WAPC acknowledges there may be circumstances where a greater level of lighting may be required for road safety. Lighting conditions may be amended to reflect the appropriate standard in conjunction with the road authority and should have regard to the dark sky principles and objectives of this policy.

#### **Public open space lighting**

Where lighting is to be installed, the WAPC will apply conditions requiring lighting to be in accordance with the dark sky principles, and any relevant Australian Standards.

Where lighting for sporting activities is required (i.e. football ovals, cricket pitches and tennis courts), the WAPC will apply conditions requiring lighting to comply with the relevant Australian Standards for the type of sporting activity or facility and be consistent with the dark sky principles.

### **5.5 Local planning policy**

A local planning policy (LPP) may be used to provide specific development standards for development applications in a local context. A model policy is provided at **Appendix 3**, which can be adopted and/or modified as required.

### **5.6 Development**

#### **Development approval**

In considering applications for development approval, decision-makers should ensure lighting and dust management is consistent with the dark sky principles. These measures may be demonstrated through a lighting management plan and dust/construction management plan approved as part of the application by the decision-maker, or as a condition of approval. For most proposals, a basic lighting management plan and/or dust/construction management plan will be sufficient. Lighting and dust management plans should be consistent with this policy, Australian standards, DWER Guidelines and include:

- a map/plan
- lighting selection, location and illuminance values
- potential light emission recipients, including the possible impact on any protected wildlife species
- mitigation measures
- maintenance/monitoring/reporting.

In considering lighting management for a proposal with light pollution that may adversely impact a listed species under the EPBC Act or State legislation, the Australian Government's *National Light Pollution Guidelines* should be followed.

Applicants seeking approval for developments which may otherwise be exempt (i.e. an outbuilding that is non-compliant with the R-Codes) should be encouraged to install lighting consistent with the dark sky principles and *Australian Standard 4282:2019 - control of the obtrusive effects of lighting*.

## Definitions

**Astrotourism** is any kind of tourism that involves the night sky or visiting facilities related to astronomy like observatories, and combining that with the broader sense of ecotourism and interacting with the environment.

**Colour temperature** is the perceived colour of a light source ranging from cool (blue) to warm (red), measured in Kelvin (K). A low correlated colour temperature such as 2500K will have a warm appearance whilst 6500K will appear cold.

**Dark sky place** is the term used by the International Dark-Sky Association to certify places as being 'dark' and free from light pollution. This term may relate to communities, parks, reserves, sanctuaries, places and developments.

**DWER Guidelines** means the Department of Water and Environmental Regulation's Guidelines for managing the impacts of dust and associated contaminants from land development sites, contaminated sites, remediation and other related activities (March 2011, as amended).

**Dust generating activities** includes any development or works that generate solid/granular particles or materials that are or could be windblown and dispersed into the air.

### **National Light Pollution Guidelines**

for Wildlife means Commonwealth's guidelines that provide a framework for assessing and managing light pollution impacts on wildlife, as well as how to manage artificial light.

**Observatory** means any structure or land containing optical and/or radio telescopes used for scientific, tourism, business, defence and/or educational purposes. It includes permanent observatories, defence observatories, land that is frequently used for the above purposes and specifically those observatories listed in Table 1.

**Table 1: Western Australian Observatories**

| Observatory                           | Location  | Local government   |
|---------------------------------------|---|--------------------|
| Gravity Discovery Centre              | 1098 Military Road<br>Yeal WA 6503                            | Shire of Gingin    |
| Murchison Radio-astronomy Observatory | Booldy Station<br>Beringarra Pindar Road<br>Murchison WA 6630 | Shire of Murchison |
| Perth Observatory                     | 337 Walnut Road<br>Bickley WA 6076                            | Shire of Kalamunda |
| Sandstone Observatory                 | 1 Griffith Street<br>Sandstone WA 6639                        | Shire of Sandstone |

## Appendix 1 – Dark sky principles

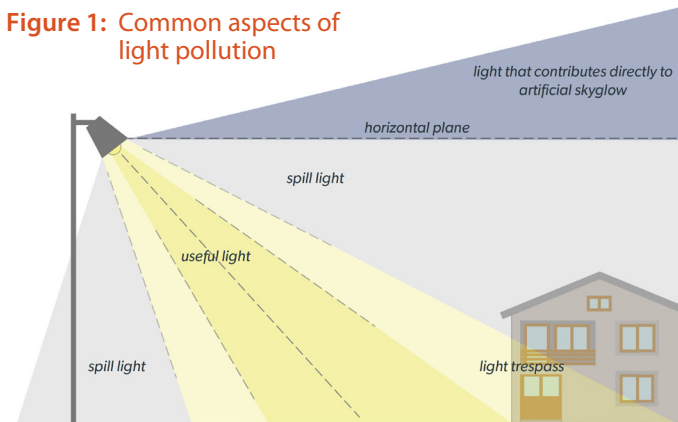
The WAPC adopts the following principles to guide implementation of dark sky standards:

### Principle 1 – Eliminate light spill

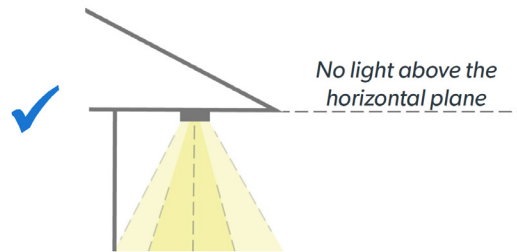
Light spill is light that falls outside of the area which is intended to be lit and contributes directly to artificial sky glow. Lighting should generally be:

- in the 'as installed' position to achieve 0% upward light waste ratio (UWLR)
- directed downward and prevented from shining above the horizontal plane
- shielded
- mounted under eaves, verandas or roof
- internalised within buildings
- using directional fittings to ensure that light is directed
- mounted higher to reduce light spill, through a more efficient and effective light spread.

**Figure 1: Common aspects of light pollution**



**Figure 2: Acceptable asymmetric lighting installed below an eave**



**Figure 3: Non-shielded light fitting**



**Figure 4: Shielded light fitting**



**Figure 5: Non-shielded light fitting**



**Figure 6: Shielded light fitting**



**Figure 7: Shielded flood lights**



**Principle 2 – Avoid over lighting**

Lighting should be minimised to light the task, rather than the environment.

This can be achieved by using fewer lights, lights that generate less light (lumens) use of dimmer switches and switching lights off when not required, particularly between the hours of 11:00pm and sunrise (such as smart lighting or other efficient lighting technologies).

**Principle 3 – Use energy efficient bulbs**

Improvements in technology means that lights are now smaller and more powerful, using smaller amounts of energy (watts) to generate the same amount of light (lumens). Energy-efficient globes such as LEDs and compact fluorescent should be used.

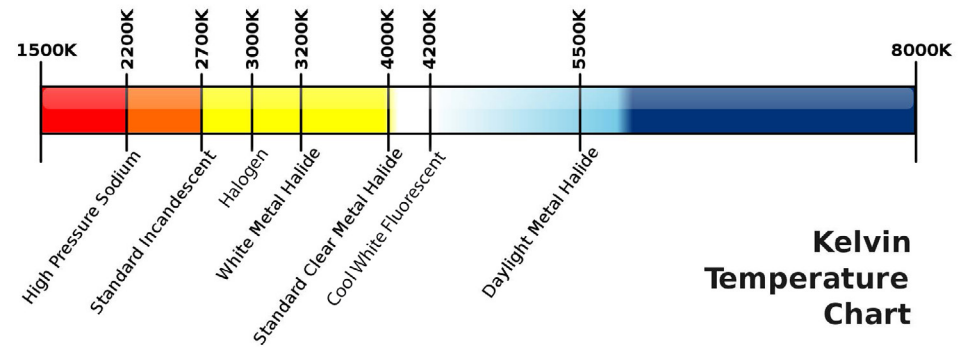
**Principle 4 – Ensure lights are not directed towards reflective surfaces**

Consideration should be given to the reflectivity of surfaces within a development. Surfaces such as grass have low reflective properties, whereas uncoloured concrete, sand or light-coloured walls have a high reflectivity. A schedule of colours and materials should be provided with an application, or as a condition of approval where required by the decision maker. Table 2 provides a guide to the reflective properties of common surfaces.

**Principle 5 – Use warm white colours**

The major difference between types of light bulbs is the distribution in light wavelength. The choice of light type can affect observatories because some telescopes can filter light at certain wavelengths, preventing interference with observations, whereas others cannot. As the atmosphere scatters blue-white light waves the most, outdoor lighting should use warm white or filtered LEDs with a correlated colour temperature (CCT) of less than 2500K (Figure 8).

**Figure 8: Kelvin temperature chart**  
 Note: With LEDs, any colour temperature can be produced, but warm colours are preferred



**Table 2: reflective properties of common surfaces**

| Surface                            | Reflective properties |
|------------------------------------|-----------------------|
| Natural grass and vegetation       | Low                   |
| Painted surface (dark)             | Low                   |
| Pre-coloured factory metal (dark)  | Low                   |
| Brick (dark)                       | Low                   |
| Raw or stained timber              | Medium                |
| Stone surface                      | Medium                |
| Uncoloured concrete                | High                  |
| Painted surface (light)            | High                  |
| Artificial grass (sand base)       | High                  |
| Pre-coloured factory metal (light) | High                  |
| Brick (light)                      | High                  |
| Zincalume steel (unpainted)        | High                  |



## Appendix 2 – Special Control Areas model provisions

| Name of area                              | Purpose   | Objectives   | Additional Provisions   |
|---|---|--|---|
| [INSERT SPECIAL CONTROL AREA NAME/NUMBER] | To protect the night sky and environment from artificial light [AND/OR] dust pollution. | <ol style="list-style-type: none"><li>1. Preserve and protect the night sky for future generations.</li><li>2. Minimise impacts of dust pollution.</li><li>3. Facilitate astrotourism through flexible local planning frameworks.</li><li>4. To protect astronomical, commercial, scientific, cultural and environmental land uses that rely upon the night sky from the adverse impacts of subdivision and development.</li><li>5. To facilitate development that supports astrotourism opportunities.</li><li>6. Minimise the impact of light pollution on wildlife.</li></ol> | <ol style="list-style-type: none"><li>1. Development approval is required for [INSERT USE/DEVELOPMENT] within the special control area.</li><li>2. The local government may require a lighting management plan [AND/OR] dust management plan where the proposal may result in light pollution [AND/OR] dust pollution.</li><li>3. The above provisions may be varied at the discretion of the local government and on the advice of any relevant referral agency.</li></ol> |

## Appendix 3 – Model local planning policy

### Purpose

[INSERT PURPOSE STATEMENT]

To provide guidance on light spill and dust management for development proposals located within identified dark sky and astrotourism locations, or in locations where the local government deems applicable.

### Objectives

- [INSERT OBJECTIVES]
- This policy seeks to preserve and protect the night sky for future generations through environmentally-responsible outdoor lighting and dust management.
- Provide a basis for decision-making and establishment of principles to achieve night sky protection.
- To identify and protect wildlife from the effects of light pollution.

### Legal status

This policy is adopted under deemed provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015* which enables the [INSERT LOCAL GOVERNMENT] to prepare local planning policies for any matter related to the planning and development of the Scheme area. The local planning policy can only have effect where consistent with the deemed provisions and local planning scheme.

### Definitions/abbreviations

| Name of area               | Additional Provisions  |
|----------------------------|--|
| <b>Asymmetric</b>          | Asymmetric beams allow light to be concentrated in one direction and prevents the need for light fittings to be mounted such that they are pointed down.   |
| <b>Colour temperature</b>  | The perceived colour of a light source ranging from cool (blue) to warm (red), measured in Kelvin (K). A low correlated colour temperature such as 2500K will have a warm appearance whilst 6500K will appear cold.  |
| <b>Dark Sky Principles</b> | Principle 1: Eliminate light spill<br>Principle 2: Avoid over lighting<br>Principle 3: Use energy efficient bulbs<br>Principle 4: Ensure lights are not directed towards reflective surfaces<br>Principle 5: Use warm white colours  |
| <b>Development</b>         | As defined in the <i>Planning and Development Act (2005)</i>   |
| <b>Observatory</b>         | Any structure or land containing permanent optical and/or radio telescopes that are fixed or erected and used for scientific, tourism, business, defence and/or educational purposes. Includes permanent observatories, land that is frequently used for the above purposes, and those observatories listed in the Dark Sky and Astrotourism Position Statement. |
| <b>Regulations</b>         | Means the <i>Planning and Development (Local Planning Schemes) Regulations 2015</i> .  |
| <b>Scheme</b>              | Means the [INSERT SCHEME]  |
| <b>Symmetric</b>           | Symmetric beams are produced by fittings that distribute light equally in all directions and is typically seen in floodlighting. This form of lighting is detrimental to the night sky and contributed toward artificial sky glow.   |

**Policy Provisions**

**1. Specified exemptions**

[INSERT EXEMPTIONS]

This policy does not apply to:

- 1.1 Development exempt under Clause 61 of the Regulations.
- 1.2 Residential development of Single Houses (including the development, extension or ancillary structures on the same lot).
- 1.3 A change of land use unless there is a works component, which is not exempt under this policy.

Unless located within a special control area.

**2. Development standards**

2.1 General

Lighting management

[INSERT LIGHTING MANAGEMENT STANDARDS]

2.1.1 A lighting management plan is to be submitted with all applications subject to this policy. Where a lighting management plan is not submitted, the [INSERT LOCAL GOVERNMENT] may, at its discretion, refuse to accept the application under clause 63 of the Regulations. Alternatively, the [INSERT LOCAL GOVERNMENT] may apply a condition requiring a lighting management plan, prior to commencement of development. This may include any details relevant to the ensuring that the application is consistent with Dark Sky Principles, at the Local Government’s discretion. Where no external lighting is proposed, this should be stated.

2.1.2 All lighting must:

- be pointed downward to prevent upward light spill
- be shielded such that only the intended area to be lit is illuminated, and any light spill created by the luminaire which is not directed to the intended area is effectively shrouded. (see the Western Australian Planning Commission’s Dark Sky Position Statement for examples)
- be commensurate with the intended use of the land and to the minimum standard to ensure safety and security, but no greater
- be switched off or on a timer so that lighting is off/minimal between the hours of 10pm and 4am
- use energy-efficient lighting bulbs/systems (i.e. LED)
- use warm white or filtered LEDs with a correlated colour temperature (CCT) of less than 2500K
- be asymmetric (when floodlighting is required)
- only face surfaces with low reflective properties in accordance with **Table 1**.

**Table 1: Surface reflectivity**

| Surface                           | Reflective properties | Surface                            | Reflective properties |
|-----------------------------------|-----------------------|------------------------------------|-----------------------|
| Natural grass and vegetation      | Low                   | Uncoloured concrete                | High                  |
| Painted surface (dark)            | Low                   | Painted surface (light)            | High                  |
| Pre-coloured factory metal (dark) | Low                   | Artificial grass (sand base)       | High                  |
| Brick (dark)                      | Low                   | Pre-coloured factory metal (light) | High                  |
| Raw or stained timber             | Medium                | Brick (light)                      | High                  |
| Stone surface                     | Medium                | Zincalume steel (unpainted)        | High                  |

Dust management

[INSERT DUST MANAGEMENT STANDARDS]

2.1.3 Where development may result in the generation of dust, applications should include a dust management plan as part of an application for development approval. Where a dust management plan is not submitted, the [INSERT LOCAL GOVERNMENT] may apply a dust condition requiring a management plan, prior to commencement of development. The dust management plan should be consistent with the Department of Water and Environmental Regulation’s *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities* (March 2011).

2.2 Commercial/Industrial/Mixed Use/Non-residential

2.2.1 In addition to the general provisions of this policy, a condition will be applied requiring compliance with *Australian Standard 4282-2019: Control of obtrusive effects of outdoor lighting*.

### 2.3 Signage

2.3.1 In addition to the general provisions of this policy, internally or externally lit signage should comply with the internationally accepted limits in accordance with **Table 2**.

**Table 2: Signage luminosity**

| <b>Illuminated areas<br/>(square metres)</b> | <b>Maximum luminance at a point<br/>(candela per square metre)</b> |
|--|--|
| More than 10                                 | 300  |
| 2 to 10                                      | 600  |
| 0.5 to 2                                     | 800  |
| Less than 0.5                                | 1000   |