

Light Pollution on Dunsink Observatory

Whilst it is fundamental that the integrity of the Dunsink Observatory is not impacted by new light sources from any developments in the vicinity, the classifications, and subsequent requirements, should be reconsidered for applicability.

It is our understanding that the relevant issues are light pollution onto the observation instruments at Dunsink Observatory.

Light pollution can be defined as:

1. Skyglow , arising from wasteful light produced by artificial sources emitted upwards and scattered by aerosols in the atmosphere.
2. Light trespass , whereby unwanted light at night is incident on a surface.
3. Glare , excessive brightness at night, which creates high contrast and hence decreased visibility.

The current text identifies an **E1: Intrinsically Dark** classification for lands within 250m of the Observatory and lands within 500m as **E2: Low District Brightness** as below:

PA SH 13.6:

Include two new map-based Local Objectives at lands at Dunsink Observatory as follows:

Objective XX

Future development on lands within a radius of 250m of the Observatory House shall demonstrate conformity with best lighting practices in minimising the impacts of these factors, as described by the International Dark Sky Association and their standards. A light intensity Zone Designation of E1: Intrinsically Dark would be implemented in accordance with Objective DMSO246 Hierarchy of Light Intensities.

Objective XX

Future development on lands within a radius of 500m of the Observatory House shall demonstrate conformity with best lighting practices in Fingal County Council and our standards. A light intensity Zone Designation of E2: Low District Brightness would be implemented in accordance with Objective DMSO246 – Hierarchy of Light Intensities.

These designations are listed in Chapter 14 Development Management Standards 14.20.18 Light Pollution within Objective DMSO246 – Hierarchy of Light Intensities.

The designations are as follows:

| ZONE | SURROUNDING | LIGHTING ENVIRONMENT | EXAMPLES |
|------|-------------|----------------------------|--|
| E1 | Natural | Intrinsically Dark | Natural parks |
| E2 | Rural | Low District Brightness | Rural, small village, relatively dark urban locations |
| E3 | Suburban | Medium District Brightness | Small town centres or urban locations |
| E4 | Urban | High District Brightness | Town/ city centres with high levels of night-time activity |

Development proposals that include external lighting should include details of the external lighting scheme.

It can be noted from this that a classification of E1 is relevant to “Natural Parks” and would not be suitable, or achievable, for developments at this site location.

Objective DMS0246 references the Institute of Lighting Engineers publication, Guidance Notes for the Reduction of Light Pollution published in the UK as a document to be considered for determining relevant designations.

Table 2 within this document further clarifies what relevance each designation would have:

Table 2: Environmental zones

| Zone | Surrounding | Lighting environment | Examples |
|------|-------------|---|--|
| E0 | Protected | Dark (SQM 20.5+) | Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places |
| E1 | Natural | Dark (SQM 20 to 20.5) | Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc. |
| E2 | Rural | Low district brightness (SQM ~15 to 20) | Sparsely inhabited rural areas, village or relatively dark outer suburban locations |
| E3 | Suburban | Medium district brightness | Well inhabited rural and urban settlements, small town centres of suburban locations |
| E4 | Urban | High district brightness | Town / City centres with high levels of night-time activity |

Of particular relevance is the lighting environment Sky Quality Meter ranges for each designation.

On the Dunsink DIAS website, raw data is available on Sky Quality results for the Observatory:

Light Pollution

A “light meter” was installed at the Observatory in 2019, to measure the night-sky brightness and light pollution at Dunsink since 2019. Working with Prof. Brian Espey of Trinity College Dublin, we are contributing data to a nationwide project monitoring the evolution of [light pollution in Ireland](#). With this dataset, researchers can make the case in support of initiatives to reduce light pollution and give everyone the opportunity to see the stars. Some of the [raw data](#) are available [here](#).

The data set from 01/07/2020 to 24/06/2021 has a maximum SQM of **19.338** identifying the current relevant designation of the Observatory as **E2: Rural** based on values in Table 2 of ILP guide.

Therefore, we would respectfully suggest that it would not be possible to achieve the designation of E1 on these lands.

We would therefore suggest that instead of radius requirements for lands within 250m and 500m of the Observatory, specific values should be identified for Light Pollution on to the Observatory House and South Dome.

Some of the measured requirements under E1/E2 could still be required in order to reduce the possibility of light pollution to the Observatory buildings. However, as the lands subject of this submission, is a proposed residential site, the requirement for Curfew lighting levels (further night time reduction) should not be implemented in order to provide a safe and secure residential environment. The definition of curfew from the ILP guide is:

* Curfew: The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied the local planning department. Depending upon application curfew times often commence between 21:00 to 23:00 and may run until 07:00. However, exact curfew hours should be carefully applied to ensure the reduction of obtrusive light is prioritised within the immediate environment and towards sensitive human as well as fauna and flora receptors.

Therefore, the requirements of light pollution onto the Observatory House should be limited to those defined in the yellow boxes below:

Table 3 (CIE 150 table 2): Maximum values of vertical illuminance on premises

| Light technical parameter | Application conditions | Environmental zone | | | | |
|---|------------------------|--------------------|----------|------|-------|-------|
| | | E0 | E1 | E2 | E3 | E4 |
| Illuminance in the vertical plane (E_v) | Pre-curfew | n/a | 2 lx | 5 lx | 10 lx | 25 lx |
| | Post-curfew | n/a | <0.1 lx* | 1 lx | 2 lx | 5 lx |

Table 4 (CIE 150 table 3): Limits for the luminous intensity of bright luminaires⁴

| Light technical parameter | Application conditions | Luminaire group (projected area A_p , in m^2) | | | | | |
|---|---------------------------------|--|-------------------------|------------------------|------------------------|------------------------|-----------------|
| | | $0 < A_p \leq 0.002$ | $0.002 < A_p \leq 0.01$ | $0.01 < A_p \leq 0.03$ | $0.03 < A_p \leq 0.13$ | $0.13 < A_p \leq 0.50$ | $A_p > 0.5$ |
| Maximum luminous intensity emitted by luminaire (I in cd) ⁵ | E0 Pre-curfew Post-curfew | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 |
| | E1 Pre-curfew | 0.29 d | 0.63 d | 1.3 d | 2.5 d | 5.1 d | 2,500 |
| | E2 Pre-curfew Post-curfew | 0.57 d 0.29 d | 1.3 d 0.63 d | 2.5 d 1.3 d | 5.0 d 2.5 d | 10 d 5.1 d | 7,500 500 |
| | E3 Pre-curfew Post-curfew | 0.86 d 0.29 d | 1.9 d 0.63 d | 3.8 d 1.3 d | 7.5 d 2.5 d | 15 d 5.1 d | 10,000 1,000 |
| | E4 Pre-curfew Post-curfew | 1.4 d 0.29 d | 3.1 d 0.63 d | 6.3 d 1.3 d | 13 d 2.5 d | 26 d 5.1 d | 25,000 2,500 |

Table 7 (CIE 150 table 6): Maximum values of upward flux ratio of installation (of four or more luminaires)

| Light technical parameter | Type of installation | Environmental zones | | | | |
|-----------------------------|----------------------|---------------------|-----|----|----|----|
| | | E0 | E1 | E2 | E3 | E4 |
| Upward flux ratio (UFR) / % | Road | n/a | 2 | 5 | 8 | 12 |
| | Amenity | n/a | n/a | 6 | 12 | 35 |
| | Sports | n/a | n/a | 2 | 6 | 15 |

We would therefore submit that the text within this section reads as follows:

(No change proposed to the following Material Alterations)

Due to the nature of the scientific research undertaken by the observatory it has a particular sensitivity to light pollution coming from the surrounding environment which would need to be carefully considered for any future development in the area.

However, there are significant challenges in delivering such lands including provision of physical and social infrastructure, fragmented land ownership, **the sensitivity of the historic observatory to increased night-time light levels**, and the challenges of implementation.

Prepare a local statutory plan **for the Long Term Strategic Reserve lands** at Dunsink **during the lifetime of this Development Plan**, in consultation with the relevant stakeholders, including an infrastructural audit with costings and implementation strategy to enable sustainable regeneration and development of the area **over the medium to long term** that is cognisant of, and sensitive to the significant historic buildings within the area including the nationally important architectural heritage site of Dunsink Observatory. This plan shall include Dunsink Observatory lands and the provision of a Planetarium.'

Include two new map-based Local Objectives at lands at Dunsink Observatory as follows:
Objective XX

(Proposed additional text in blue, with proposed deletion in green strikethrough)

Future development on lands within a radius of ~~250m~~ 500m of the Observatory House shall demonstrate conformity with best lighting practices in minimising the impacts of these factors, as described by the International Dark Sky Association and their standards. **Light pollution values on to the Observatory House Dome and South Dome will be kept within the levels classified as E1 (Pre-curfew) as detailed in Tables 3, Table 4 and Table 7 of the ILEP Guide in accordance with Objective DMSO246 Hierarchy of Light Intensities.**

Objective XX

~~Future development on lands within a radius of 500m of the Observatory House shall demonstrate conformity with best lighting practices in Fingal County Council and our standards. A light intensity Zone Designation of E2: Low District Brightness would be implemented in accordance with Objective DMSO246—Hierarchy of Light Intensities.~~

Future development on lands to the south of the Observatory will be designed to protect the view angle to the horizon along the Meridian Line from the Observatory House dome.

It is submitted that the proposed amendments to these 2 Objectives will more effectively achieve the required protection of the Observatory in relation to light pollution rather than a blanket criterion to an area of land.