

Xyst Limited
1st Floor, Daily Telegraph Building,
49 Tennyson Street,
PO Box 512, Napier 4110



22 April 2020

Alex Wakefield

Via Email

Tēnā koe Alex,

Timaru District Plan Review: Lighting Standards

Thank you for your instructions to provide advice on the Lighting Standards within the proposed Timaru District Plan.

Please find attached our revised draft report incorporating your requested changes and including a response on your question regarding the proposed signage rules. The proposed lighting standards make reference to AS/NZS 4282:2019 which should be read in conjunction with the proposed rules. I have attached my copy for your information.

I look forward to any feedback you may have and will be available to discuss at your convenience.

Nā māua noa, nā

A handwritten signature in black ink, appearing to read "Paul Wilson". The signature is fluid and cursive, with a prominent loop at the start.

Paul Wilson
Director

Timaru District Plan Review: Lighting Standards (Draft Report)

1. Background

- 1.1. The review of the Timaru District Plan 2005 commenced on 27 February 2014 and the Council are now at the stage of preparing a Draft Plan. The Draft Plan is expected to be ready for public consultation in the second half of 2020.
- 1.2. There is an increasing awareness in the community of the effects of light pollution. In addition, other communities have recognized the benefits associated with astro-tourism and enhanced quality of life by protecting the night sky from the effects of light pollution.
- 1.3. The International Dark Sky Society (IDA) is a non-governmental, not-for-profit organisation established to “preserve and protect the night-time environment and our heritage of dark skies through environmentally responsible outdoor lighting”. The IDA administers an accreditation scheme where communities can apply to have a locality recognised as a dark sky place. There are several categories of accreditation including dark sky community, dark sky reserve and at the highest level, dark sky sanctuary. Many will be familiar with the Aoraki-Mackenzie Dark Sky Reserve (2012) which was the first such reserve created in New Zealand. This was followed by the Aotea-Great Barrier Island Dark Sky Sanctuary (2017) and the Rakiura-Stewart Island Dark Sky Sanctuary (2019). We are aware of other communities in New Zealand in the process of applying for accreditation.
- 1.4. The widespread introduction of LED lighting for street lighting and exterior lighting has both presented opportunities and threats to the protection of the night sky. On one hand, when correctly installed, LED lighting is generally designed to emit light in a downwards direction thereby limiting upward light spill to the light reflected upwards from surfaces (such as roads). On the other hand, some of the exterior LED lighting installed is either installed incorrectly (with high tilt angles) or is comprised of cool white LED light sources (4000K or greater) with high levels of light in the blue part of the light spectrum which can interfere with astronomical observations and may have impacts on public health and wildlife.
- 1.5. There is considerable debate in the lighting community about the effects of blue light on human health. There are many passionate individuals who are advocating strongly the removal and/or avoidance of the use of LED light with a correlated colour temperature (CCT) of greater than 2,700K. There are others who consider the level of exposure to blue light sources from public lighting is minimal when compared to exposure to interior lighting, media and computing displays, and mobile devices.

- 1.6. In 2018 the Royal Society Te Apārangi published a useful evidence summary titled the Impacts of artificial blue light on health and the environment. The report notes that “although blue wavelength light potentially contributes to health problems associated with circadian disruption, research has not conclusively demonstrated that blue wavelength light exposure at night causes an increase in these health risks.”
- 1.7. Almost all District Plans contain rules to limit the effects of spill light and glare from adjacent uses, but few currently include objectives to limit light pollution and control the type and quantity lighting that can be installed as of right.
- 1.8. Recognising the risks that light pollution poses and the benefits of protecting the night sky, some communities are therefore seeking to place greater controls within their district plans on the type of and nature of lighting that is permitted, controlled, or prohibited.
- 1.9. The Timaru District Council is proposing to introduce a new Light chapter of the District Plan under review would provide provisions that manage the use of outdoor lighting across the District. A light protection area or ‘dark sky reserve’ is proposed by a community group in Geraldine. However, because street lighting across the district is in the process of being replaced with 4000K LED lights there is will be difficulty in achieving a dark sky reserve for the Geraldine township in the foreseeable future unless the 4000K LED lights are replaced with 3000K lights. Alternatively installing 3000k LED lighting at Peel Forest Township is possible, and this would mean that Peel Forest would be the gateway to the Dark Sky Reserve.

2. Other Council Plans

2.1. Auckland Unitary Plan

- 2.1.1. The Auckland Unitary Plan (Operative in part) contains a comprehensive set of region wide rules to control the effects of lighting. The rules (E24) are attached. These include the following objective, “the adverse effects of outdoor lighting on the environment and safety of road users are limited” and specific policies to “Control the intensity, location and direction of artificial lighting to avoid significant glare and light spill onto adjacent sites, maintain safety for road users and minimise the loss of night sky viewing.”

- 2.1.2. General standards referenced are AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting and the rules categorise each district plan zone against the lighting categories set out in AS 4282-1997.
- 2.1.3. Importantly AS 4282-1997 has recently been reviewed and replaced by AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting. There are significant changes in new standard compared to the previous edition, notably:
- the 1997 standard is a guidance document whereas the new standard has specific requirements for compliance with the standard.
 - The classification of environmental areas has been expanded to include environmentally sensitive areas and better align to the categories used in international standards
 - Notes the needs for sensitive locations such as dark sky reserves to have requirements in addition to the standards.
- 2.1.4. The rules introduce a curfew between 10pm and 7am where permitted light levels are significantly reduced. Outside of these hours, permitted illuminance at the boundary is much higher than most district plans (100 lux).
- 2.1.5. The rules introduce vertical illuminance limits on windows between 2-25 lux pre curfew and between 0-4 lux during curfew. Luminous intensity limits are also introduced.
- 2.1.6. There is no requirement limit upward light spill or the lumen output of light fixtures.

2.2. Mackenzie District Plan (Section 12)

- 2.2.1. The Mackenzie District Plan (MDP) contains district wide rules to control the effects of lighting. The rules (S12) are attached. The rules note “an abundance of outdoor lighting can adversely affect people's ability to view the night sky and affect the ability for effective research to be undertaken at Mt John University Observatory”.
- 2.2.2. Specific policies and rules are established to protect the Mount John University Observatory through the introduction of an Outdoor Lighting Restriction zone. Lighting within in the zone must be:

- Fully shielded
- Be warm colour (light source would have more than 15% of the total emergent energy flux in the spectral region below 440nm. The filters used must transmit less than 10% of the light at any wavelength less than 440nm.)
- Between 11pm and sunrise No person shall illuminate or display the following outdoor lighting in the designated area:
 - a. searchlights.
 - b. illumination of any public recreational facility.
 - c. outside illumination for aesthetic purposes of any building by floodlight.
 - d. any outdoor illumination in which light is produced by high-pressure sodium, metal halide, mercury vapour lighting or fluorescent lighting, unless these lamps were installed prior to 1 January 1979 in the Business or Residential Zones in Lake Tekapo or 1 March 1986 in all other zones.
- All fixed exterior lighting shall be directed away from adjacent roads, Lake Ruataniwha and properties.

2.2.3. Outside of the Outdoor Lighting Restriction Zone all lighting is a Permitted Activity provided all fixed exterior lighting is directed away from adjacent properties and roads. There are no specific limits on light spill or glare at the boundary which is common to most district plans.

2.3. Comments on the MacKenzie District Plan - Section 12: Outdoor Lighting and Aerial Distractions

2.3.1. The MDP Rules provide increased restrictions on use of artificial light in the Outdoor Lighting Restriction Zone however outside of this zone there is essentially no practical control on the effects of obtrusive light.

2.3.2. The MDP Outdoor Lighting Restriction Zone does not adjoin the Timaru District other than in the vicinity of the Two Thumb Range.

2.3.3. Within the Outdoor Lighting Restriction Zone, the rules require lights to be fully shielded but do not specify any restriction on the aiming of light fittings. Poorly aimed or tilted light fittings (including street lights) even when fully shielded is a significant contributor to light pollution.

- 2.3.4. The requirement for a warm colour is supported however the technical parameter used is not commonly used in the lighting consumer market and would be difficult for developers or residents to understand or comply with.
- 2.3.5. It is difficult to obtain the proportion of the emergent energy flux in each spectral region without going back to the LED chip manufacturer that has supplied the LEDs used in the particular fitting. The lighting technical parameter of a *“light source would have more than 15% of the total emergent energy flux in the spectral region below 440nm”* is in our view impractical to use in a rule. Using the term CCT <3000K would be more practical and ensure greater compliance.
- 2.3.6. The curfew time of 11pm seems quite late and would disadvantage astronomical observers and residents and visitors wishing to enjoy the night sky with minimal light pollution. Other District Plans use 10pm which seems a more practical compromise between utility and viewing of the night sky.
- 2.3.7. We consider that the MDP rules are not a useful starting point for considering improved rules in the Timaru District Plan. We understand they were developed prior to the widespread introduction of LED and therefore have been geared towards encouraging the use of Low Pressure Sodium which has very poor colour rendering properties and would be difficult to source in today's market.

2.4. Christchurch District Council

- 2.4.1. The Christchurch City District Plan contains specific zone-based rules to control the effects of lighting. A summary of the rules is attached.
- 2.4.2. Spill light (vertical and horizontal) measured 2m within the boundary of the adjacent site is limited to between 4 lux (in open space, special purpose and residential zones), 10 lux (rural and special commercial and industrial zones) and 20 lux (general commercial and industrial zones).
- 2.4.3. Spill light (vertical and horizontal) is limited to 2.5 lux into any part of a major arterial road or minor arterial road or arterial route where this would cause driver distraction.

- 2.4.4. Guidance is provided to reduce spill and glare such as illuminating only the target area, shielding light above the horizontal and keeping main beam angle below 70°.

2.5. Southland District Council (Proposed Rules)

- 2.5.1. The Southland District Council recently publicly notified its intentions to change the district plan lighting rules as they apply to Stewart Island. The change was brought about by the creation of the Rakiura- Stewart Island Dark Sky Sanctuary.
- 2.5.2. The Council agreed to instigate the plan change as part of fulfilling its commitments under the Memorandum of Understanding that was agreed between stakeholders and the IDA for the creation of the Rakiura- Stewart Island Dark Sky Sanctuary.
- 2.5.3. The plan change (when adopted) will:
- Introduce that illumination of any sign on Stewart Island will be a restricted discretionary activity and only be permitted in the industrial zone
 - Create a policy to “Manage subdivision land use and development in a manner that maintains or enhances the dark quality of the Stewart Island / Rakiura night sky (excludes offshore islands)”.
 - Amend the rules for lighting in the Stewart Island / Rakiura Urban Zone so that:
 - (a) The spill of light from artificial lighting (excluding street lights and traffic signals) on to any other site (except as provided for by (b) below) shall not exceed 3 lux (horizontal and vertical) when measured at or within the boundary of any other site.
 - (b) All outdoor lighting shall be directed away from adjoining properties.
 - (c) All fixture shall be fully shielded with no light spill being permitted above the horizontal plane.
 - (d) Artificial lighting colour is to be ‘warm white’ (being equal to or less than 3000K correlated colour temperature only).
 - (e) Note: for clarification, outdoor garden solar lights are exempt from this rule.
 - Amend the rules for lighting in the Stewart Island / Rakiura Industrial Zone so that:
 - The spill of light from artificial lighting (excluding street lights and traffic signals) shall not exceed 10 lux (horizontal and vertical) when measured at or within the boundary of any other site.

- All outdoor lighting shall be directed away from adjoining properties.
- All fixture shall be fully shielded with no light spill being permitted above the horizontal plane.
- Artificial lighting colour is to be 'warm white' (being equal to or less than 3000K correlated colour temperature only).

2.5.4. The plan change has been notified and a hearing has taken place with one submitter (who was outside of the jurisdiction of the rule) appearing. The relevant s32a and s42a reports can be provided with the agreement of the Southland District Council if required.

2.5.5. Xyst provided advice to the Southland District Council on the proposed plan change and assisted Council staff with the hearing.

2.6. Selwyn District Plan

2.6.1. The Selwyn District Council (SDC) is currently reviewing the Light Chapter of the Selwyn District Plan.

2.6.2. The Selwyn District Council is in the process of reviewing its district plan rules. As these have not been notified or circulated to the public it would not be appropriate to include the proposed specific provisions in this report.

2.6.3. Xyst provided advice to the Selwyn District Council on their draft proposed changes to the Lighting Chapter. Timaru District Council (TDC) staff should make a direct approach to SDC (Vicki Baker) if they wish to view the draft light chapter.

2.6.4. Two baseline reports were provided in 2017, one to assess [best practice in Lighting and Glare provisions](#) and the second to consider [Obtrusive Lighting Effects of Outdoor Lighting](#).

2.6.5. The SDC has published a [Preferred Option Report](#) on the 18th of April 2018. This report recommends the following changes:

- the policies and rules relating to lighting and glare be updated to ensure that they are clear, consistent and do not overlap;
- inconsistencies between the Council's Engineering Code of Practice and the District Plan in relation to management of spill light and glare be resolved;

- that if a joint Australian and New Zealand standard on obtrusive effects of outdoor lighting is released in the near future, the District Plan spill light standards be reviewed to ensure they will continue to not result in adverse effects beyond property boundaries;
- rule standards relating to management of glare be amended to recognise the role of permanent obstructions in reducing glare effects;
- the West Melton Observatory provisions be retained in the Proposed District Plan, but that minor amendments be made to ensure that objectives and policies are reflected in rules and to correct minor errors;
- night glow be described as a potential issue in the Proposed District Plan, but specific policies not be included unless submitters raise it as a significant issue.

2.6.6. Since this time the SDC has refined the proposed rules and they are in draft form.

2.7. Timaru District Plan

2.7.1. The Timaru District Plan contains specific zone-based rules to control the effects of lighting.

2.7.2. Generally exterior lighting is required to be directed away from neighbouring sites and roads other than in the recreation zone.

2.7.3. Spill light (vertical only) at the boundary is limited to 10 lux between 10:00pm and 7:00am and 20 lux at other times across all zones other than the rural zone.

2.7.4. A limit of 1 lux in the vertical plane on windows of other sites applies between 10:00pm and 7:00am and 10 lux at other times across the industrial and recreation zones.

2.7.5. A higher level of control applies in the rural zone where a limit of 5 lux of light spill on adjoining properties applies throughout the night and all outdoor lighting (notably including street lighting) shall be shielded from above in such a manner that the edge of the shield shall be below the whole of the light source.

2.7.6. The operative Timaru District Plan policies and rules relating to lighting are extracted from the District Plan and presented below.

2.7.7. Part D1 – Rural Zones

2.7.8. Part D1 – Rural Zone - RURAL 1 ZONE (R1)

5.5 Obtrusive Light

No lighting exceeding 20 lux measured in the horizontal or vertical planes shall fall on adjoining properties.

All exterior lighting shall be directed away from roads to avoid the incidence of light overspill which may affect the safety of motorists.

2.7.9. Part D1 – Rural Zone - RURAL 3 ZONE (R3)

Obtrusive Light

No lighting exceeding 20 lux measured in the horizontal or vertical planes shall fall on adjoining properties.

All exterior lighting shall be directed away from roads to avoid the incident of light over spill which may affect the safety of motorists.

2.7.10. Part D1 – Rural Zone - RURAL 4A ZONE (GERALDINE DOWNS)

Policy (2.4)

Exterior lighting will be managed so that it does not have a significant adverse effect on the landscape character and amenity values.

Reason:

Exterior lighting can have significant adverse effects on landscape character and amenity values.

Method:

Performance standards will set minimum standards for exterior lighting.

6.9 Artificial Lighting

(1) Except street lighting, no lighting exceeding 5 lux measured in the horizontal or vertical plane shall fall on adjoining properties.

(2) All outdoor lighting (including street lighting) shall be shielded from above in such a manner that the edge of the shield shall be below the whole of the light source.

(3) All fixed exterior lighting shall be directed away from adjacent roads and properties.

2.7.11. Part D1 – Rural Zone - RURAL 4B ZONE (BLANDSWOOD)

5.13 Glare from Artificial Lighting

No lighting exceeding 20 lux measured in the horizontal or vertical plane shall fall on adjoining properties.

2.7.12. Part D1 – Rural Zone - RURAL 5 ZONE (R5)

5.18 Obtrusive Light

No spill light from a permanently fixed artificial light source shall exceed 1 lux, measured in the vertical plane at the windows of household units on any other site between the hours 10.00pm and 7.00am, and 10 lux at all other times.

2.7.13. Part D2 – Residential Zones

2.7.14. Part D2 – ISSUE 3

There are other environmental effects such as odour, and dust emissions, lighting or traffic effects which can arise from activities which impact on the amenity of residential areas.

Explanation

Such effects can frequently have an adverse effect on other residents and residential character without being quantifiable or measurable in a practical way. Activities such as schools and medical centres can produce significant traffic effects but need to be located in residential areas for ease of access and convenience. Light spill from commercial, industrial, and sporting facilities can also have an adverse effect on residential activities.

2.7.15. Part D2 – Residential Zones 1 - 6

Obtrusive Light from Artificial Lighting

Exterior lighting shall be directed away from neighbouring sites and roads.

Other than street lighting, no spill light from a permanently fixed artificial light source shall exceed 10 lux, measured in the vertical plane, at the boundary of any other residential zoned sites between the hours of 10.00pm and 7.00am and 20 lux at all other times.

2.7.16. Part D3 – Commercial Zone Policies

3.1.2.3 To allow for more permissive noise and light levels in commercial areas than provided for in Residential Zones of the District while acknowledging that some restriction on noise levels is required where sensitive land uses share a boundary with a commercial activity.

Principal Reason

Acknowledges that many commercial activities which are provided for in commercial areas of the District generate effects from noise and light.

2.7.17. Part D3 – Commercial (All Zones)

Obtrusive Light

All exterior lighting on commercially zoned sites shall be directed away from residentially zoned land and from the carriageway of any roads.

Other than street lighting, no spill light from a permanently fixed artificial light source shall exceed 10 lux, measured in the vertical plane at the boundaries of any other sites in Residential Zones, between the hours 10.00pm and 7.00am and 20 lux at all other times.

2.7.18. Part D4 – Industrial Zone Policies

4.1.2.7 To allow for more permissive noise and light levels in industrial areas than provided for elsewhere in the District while acknowledging that some restriction on noise and light levels is required when sensitive uses, e.g. residential or natural areas, or the Rural 2 Zone adjoining Lot 3 DP 58403, share a boundary with an industrial area.

Principal Reason

Recognises that many industrial activities are inherently noisy or generate high light levels but that it is possible to provide for many of these activities in less sensitive locations.

2.7.19. Part D4 – Industrial (L and H)

Obtrusive Light

All exterior lighting on industrial zoned sites shall be directed away from residentially zoned land and from roads.

Other than street lighting, no spill light from a permanently fixed artificial light source shall exceed 10 lux, measured in the vertical plane at the windows of household units on any other sites in Residential Zones, between the hours 10.00pm and 7.00am, and 20 lux at all other times; and 1 lux measured in the vertical plane at the windows of household units on any other sites in Rural Zones, between the hours 10.00pm and 7.00am, and 10 lux at all other times.

2.7.20. Part D5 – Recreation Policies

5.1 ISSUE

Some uses of land can have adverse effects on the surrounding environment.

Explanation

There are a wide variety of recreational activities in the District ranging from passive recreational uses such as parks, through to holiday hut settlements, to active sports facilities. All of these areas have some beneficial effects in enabling people to help fulfil their various recreational aspirations. Many of these venues can also have some adverse effects on their neighbourhoods ... Lighting of sports grounds can also have adverse effects arising from glare and the extension of the hours of use of the facility.

2.7.21. Part D5 – Recreation Zone (All Zones)

Obtrusive Light

Other than street lighting, no spill light from a permanently fixed artificial light source shall exceed:

10 lux measured in the vertical plane at the boundaries of any other sites in Residential Zones between the hours 10.00pm and 7.00am, and 20 lux at all other times; and

1 lux measured in the vertical plane at the windows of household units on any other sites in Rural Zones between the hours 10.00pm and 7.00am, and 10 lux at all other times.

2.7.22. Illuminated Signs

Part D8 – Appendices contains performance standards for illuminated signs in the recreation, residential, rural zones of between 400 and 2000 candela per square metre depending on the size of the sign.

2.8. Comments on the Operative Timaru District Plan Policies and Rules

2.8.1. Obtrusive Light

The existing rules for obtrusive light on an adjoining property are set at three different levels as shown in Table 1.

Table 1 Obtrusive Light Limits

Zone	Lux on adjoining property (horizontal and vertical)	Lux measured vertical on windows of adjoining households	All exterior lighting shall be directed away from roads	All fixed exterior lighting shall be directed away from adjacent roads and properties	All exterior lighting shall be directed away from residentially zoned land and from roads	All outdoor lighting (including street lighting) shall be shielded from above
Rural 1/3	20		yes			
Rural 4A	5	1	Yes (except Street Lights)	Yes		Yes
Rural 4B	20					
Rural 5		1				
Residential 1-6	10/20			Yes		
Commercial	10/20				Yes	
Industrial	10/20	1/10			Yes	
Recreation	10/20	1/10				

In some instances, an additional limit is set on light falling on windows of adjoining households. With the use of modern fittings and with good lighting design the existing levels are practical to achieve and relatively

high when benchmarked against other plans where levels or between 2-5 lux are common. Consideration could be given to reducing the amount of spill light permitted on adjoining properties.

An additional control is included in the Rural 4A, Rural 5 and Industrial and Commercial zones to limit the amount of spill light onto windows of adjoining households. There does not appear to be a high degree of consistency in the application of this rule across the zones. Consideration should be given to more consistent and widespread application.

2.8.2. Direction of light

There are subtle differences between the various rules for aiming of lights. The first relates to fixed lighting where some rules apply to fixed and presumably mobile lighting and others to only fixed lighting. Some rules included street lights, while others don't and some rules require lighting to only be directed away from roads, others' roads and properties, or residential zoned land only.

Rules such as these are common across District Plans, but observation would suggest they are rarely complied with. If we consider the common residential "security light" it is generally directed towards the road or an adjoining property by the fact it is mounted on the house and directed outwards.

We recommend these rules are removed and replaced with measurable illuminance limits such as in the Christchurch City Plan or as in the Auckland Unitary Plan; *"The exterior lighting on any property adjacent to land on which there is a dwelling must be selected, located, aimed, adjusted and/or screened to ensure that glare resulting from the lighting does not exceed the pre-curfew or curfew limits..."*

2.8.3. Protection of night sky (sky glow)

Only the Rural 4A Zone includes a provision for the protection of the night sky by requiring shielded lighting (including street lighting). As the rule is written it does not adequately protect against upward light spill as it only specifies that *"the edge of the shield shall be below the whole of the light source"* which would not prevent such a light fixture being mounted at an angle above the horizontal which is a common issue with street lights and incorrectly installed LED floodlights.

As sky glow is an area wide and cumulative problem the restriction of design illuminances and lighting technical parameters for some activities such as sports or industrial sites to the minimum safe levels will provide additional mitigation.

2.8.4. Intrinsic darkness

The current rules do not consider the existing quality of the night sky and the desirability of protecting intrinsically dark areas from light pollution (other than the attempt discussed in 3.2.3 above). We recommend adopting the approach outlined in AS/NZS4282-2019 by using environmental zones shown in figure 1.

Zones	Description	Examples
A0	Intrinsically dark	UNESCO Starlight Reserve. IDA Dark Sky Parks. Major optical observatories No road lighting -unless specifically required by the road controlling authority
A1	Dark	Relatively uninhabited rural areas No road lighting - unless specifically required by the road controlling authority
A2	Low district brightness	Sparsely inhabited rural and semi-rural areas
A3	Medium district brightness	Suburban areas in towns and cities
A4	High district brightness	Town and city centres and other commercial areas Residential areas abutting commercial areas
TV	High district brightness	Vicinity of major sports stadium during TV broadcasts
V	Residences near traffic routes	Refer AS/NZS1158.1.1
R1	Residences near local roads with significant setback	Refer AS/NZS 1158.3.1
R2	Residences near local roads	Refer AS/NZS 1158.3.1
R3	Residences near a roundabout or local area traffic management device	Refer AS/NZS 1158.3.1
RX	Residences near a pedestrian crossing	Refer AS/NZS 1158.4

NOTE: Recreational areas are not considered commercial.

Figure 1 AS/NZS4282-2019 Table 3.1 Environmental Zones

2.8.5. Illuminated signs

Part D8 – Appendices contains performance standards for illuminated signs in the recreation, residential, rural zones of between 400 and 2000 candela per square metre depending on the size of the sign.

There is a significant technical constraint when using candela per square metre (candela being the intensity of light in particular direction) as a lighting parameter in that it requires a highly specialised, difficult to maintain and very expensive luminance meter to measure candela.

While it is technically possible to calculate the emittance of candela from a sign, practical issues arise in obtaining reliable photometric data from commonly used light sources in outdoor signs.

In addition, many outdoor signs are changing from backlit signs to electronic messaging centres (EMC) also referred to as LED signs or variable message boards. EMCs can reportedly be up to ten times brighter at night than traditionally lit billboards and can be harmful to the night time environment.

The IDA have prepared [guidance](#) for EMC which will be useful in developing rules.

Unfortunately, there is no easy answer to the issue of measurement/compliance. Candela is the correct unit of measurement to measure the brightness of a sign but in practical terms neither the installer or the Council are likely to have the means to check compliance with the rules of the installed illuminated sign.

3. Recommended Rules for the Proposed Timaru District Plan

3.1.1. AS/NZS 4282:2019 contains a useful introduction that should guide lighting rules. In particular it discusses the factors that have been used in setting the limiting values of the light technical parameters used in the Standard such as;

- the level of lighting existing in the area
- the times the lighting is to operate
- the type of lighting technology available
- the use of readily available and easily understood technical data on lighting installations that can be easily be verified at the design and assessment stages.

3.1.2. The level of lighting existing the area is relevant as intrinsically dark areas should be protected to retain the quality of night sky that already exists and furthermore intrinsically dark areas generally require less artificial light to provide effective lighting for humans as opposed to intrinsically bright areas which may require more light to counter the effects of the adaptive state of the human eye.

- 3.1.3. The times the lighting is to operate is relevant as a high level of control can be exercised by simply turning lights off or dimming lights during the late evening or early morning when there is generally less human activity and greater demand for observations of the night sky.
- 3.1.4. The type of lighting technology that is available is also important, noting that over the life of the district plan, lighting technology will most likely evolve. There is little point specifying technical parameters for which the market can currently not provide in New Zealand.
- 3.1.5. Finally, the availability of technical data, software, equipment, expertise and methods need to be considered so that lighting can be designed to achieve the desired outcomes and the likely effects of a proposed lighting design can be reliably calculated and the actual resulting light effects post installation can be readily measured.
- 3.1.6. Of the district plan rule reviewed we consider the Auckland Unitary Plan rules to be the most comprehensive and appropriate to use as a starting point for Timaru District Council.

4. Recommended Rules for the Proposed Timaru District Plan Dark Sky Area

- 4.1.1. A meeting was held in February between representatives of the Timaru District Council and Geraldine resident Rebecca Greatrex who we understand is working towards the creation of a Dark Sky Reserve in proximity to Geraldine.
- 4.1.2. The minutes of the meeting record that a roll out of 4000K LED street lights has begun in the Timaru District and that consideration was being given to replacing the recently installed 4000K LED lights with 3000K LED street lights within the Outstanding Natural Landscapes – meaning Peel Forest and north west of the Rangitata river gorge, with Peel Forrest being the gateway to a proposed Dark Skies Reserve.
- 4.1.3. The minutes also record concern about obtaining approval from NZTA for installing lighting with the CCT of less than 4000K. I can confirm that NZTA's position is:
 - The preferred value of CCT for road lighting is 4000K (neutral white). Consideration may be given to the use of 3000K (warm white) nominal CCT in areas of special environmental consideration (such as Dark Skies reserves) or high pedestrian use, but only where vehicular

movements and speeds have been managed to mitigate the potential conflicts between cars/trucks and pedestrians/cyclists.

- For 3000K luminaire options, the following criteria must be met:
 - i. the correlated colour temperature must be 3045K \pm 175K (in accordance with SA/SNZ TS 1158.6)
 - ii. the luminaire efficacy must be not less than 8% lower than the 4000K luminaire variant of the luminaire
 - iii. the colour rendition index (CRI) must be at least 70
 - iv. the luminaire must meet all other M30 acceptance criteria

4.1.4. There are now are number of approved fittings on the NZTA M30 Accepted Luminaire Schedule (19 December 2019) and many Councils have moved to install 3000k luminaires throughout their districts or in specific locations.

4.1.5. As there is a desire to create a Dark Sky Reserve within the Timaru District, it would be desirable to align any planning rules with the [current requirements for a Dark Sky Reserve](#) published by the IDA.

4.1.6. In summary the key requirements as they impact on planning rules are:

- Adoption of a comprehensive Lighting Management Plan (LMP) covering a significant number of the core communities within the dark sky reserve corresponding to at least 80% of the population and 80% of the area under protection.
- Two thirds of all light fixtures within the area covered by the LMP conform to the LMP at the time of application.
- A lighting inventory and plan to bring 90% of outdoor lighting in the core area of the dark sky reserve into compliance within five years of receiving designation.
- The LMP must meet or exceed the Council planning rules and policies.
- All fixtures with initial lamp lumens of greater than 500 lumens must be shielded and make use of timers and motion sensors.
- All fixtures must have a CCT of no greater than 3000K or the lighting must not emit more than 25% of its total spectral power at wavelengths <550 nanometres or the scotopic-to-photopic (S/P) ratio must not exceed 1:3.
- Illuminated signs must be regulated such that operation is prohibited for one hour after sunset to one hour before sunrise, must be single colour on a black background, luminance must not exceed 100

candela per square meter and the illuminated area of the sign must not exceed 18.6m².

- 4.1.7. Given this we recommend the following rules be created to address lighting in a proposed “Timaru District Dark Sky Protection Area”. These rules would be in addition to the applicable general lighting or other rules of the applicable zone:

Permitted Lighting

- (1) All exterior lighting (including street lights) with an initial lamp lumens¹ output of greater than 500 lumens must:
- a. be fully shielded² and directed/aimed in such a way that no light is emitted above the horizontal plane passing through the lowest light-emitting portion of a fixture.
 - b. have a colour corrected temperature of no greater than 3000K (warm white).
 - c. make use of timers and/or motion sensors, dimmers or other controls to minimise the operation of the lights between 10pm and 6am the following day.
- (2) Any illuminated sign (excluding traffic safety/warning signs) if operated during curfew must:
- a. be a single colour on a black background.
 - b. the illuminated area of the sign must not exceed 3m².

- 4.1.8. The area of any Dark Sky Protection Area is likely to require additional research to determine but it should closely relate to the proposed dark sky reserve boundary and support dark sky protected areas in Mackenzie District and any proposed sky glow overlay area in Selwyn District.

- 4.1.9. We would suggest that the area of the existing Outstanding Landscape Areas and Amenity Landscape Areas should be the minimum area considered for inclusion in Dark Sky Protection. Consideration should be given to the benefits of a wider area including the township of Geraldine as this is likely to generate additional astro-tourism and community benefits.

¹ “Initial lamp lumens” is defined as the number of lumens of light emitted by a lamp when new and not counting any depreciation of output due to the age of the lamp. This information can be found in manufacturer data sheets.

² “Fully shielded” is defined such that that the light source is screened and its light directed in such a way that none is emitted above the horizontal plane passing through the lowest light-emitting portion of a fixture.

4.1.10. We recommend that a feasibility study be undertaken to determine the issues and benefits associated with creating a Dark Sky Accredited Area and the type of area that would be appropriate along with an implementation plan. Xyst has prepared similar feasibility studies in Southland and these a vital first step considering accreditation from the IDA.

5. Recommended approach to the control of public lighting on roads

- 5.1.1. Street lighting is generally excluded from most district plans. It would generally be difficult to achieve common spill lighting requirements give street lighting is often placed very close to property boundaries
- 5.1.2. The New Zealand Transport Agency (NZTA) provided significant subsidies to Councils to provide street lighting on local roads. The NZTA also provides street lighting on State Highways that pass through the Timaru District and would also therefore be impacted on by any proposed rules.
- 5.1.3. The NZTA has published [M30 Specification and guidelines for road lighting design](#) which includes a [list of approved street lights](#) which is regularly updated. Road controlling authorities must use street lights that are approved by NZTA in order to receive the subsidy.
- 5.1.4. The accreditation process inherent in M30 ensures street lights are fit for purpose and there should be no need for a local authority to replicate this in its own code of practice.
- 5.1.5. When considering street lighting, there are three factors which contribute to sky glow:
- (1) the amount of light emitted by the street light that is above the horizontal so therefore emitted upward to the sky.
 - (2) the mounting angle of the street light – tilted lights will emit more light upward into the sky.
 - (3) the amount of light that is reflected upward from road surfaces and surrounds.
- 5.1.6. Councils can manage sky glow from street lights by (1) selecting fittings that do not emit any light upward, (2) ensuring new and replacement street lights are mounted horizontally and not at high tilt angles, and (3)

undertaking lighting calculations to ensure new and replacement street lighting is adequate to light the street to meet the New Zealand Standards but not provide an excessive level of lighting.

5.1.7. M30 includes provisions to limit sky glow. The NZTA recommends that only luminaires with an Upward Waste Light Ratio (UWLR) below 1% of the total light output are used. Practically speaking most LED luminaires emit 0% UWLR *when mounted at the horizontal*.

5.1.8. Unfortunately, many Councils are installing new LED lights on existing outreach brackets which often have high to very high angles of tilt which means street lights emit a significant portion of their output directly into the sky. M30 states that new installations shall be installed at tilt angles of no more than 5 degrees but is silent on retrofitting existing lighting schemes. It is essential that TDC installs LED at nor more than a 5-degree tilt (and ideally zero).

5.1.9. We are also aware that many Councils do not undertake lighting design calculations and replace existing street lights with a generic wattage of street light which may provide excessive illumination and hence higher levels of reflected light into the sky.

5.1.10. We suggest that specific rules for street lighting are not included in the District Plan other than for the Dark Sky Protected Area as this is largely addressed by M30 with the exceptions noted above.

5.1.11. We would encourage a review of the [TDC Street & Amenity Lighting Policy](#) to include protection of the night sky as a policy. This policy sits outside of the District Plan but would benefit from identifying the protection of the night sky as a Council objective.

6. Recommended Lighting Rules for the Timaru District Plan

6.1. The draft rules are attached as Appendix 1 and largely follow the format and approach of the Auckland Unitary Plan but have been modified to address the objectives and needs of the Timaru District. The rules have been aligned with the revised AS/NZS 4282 with some modification to simplify interpretation.

6.2. The rules do not apply to street lighting other than in the Dark Sky Protection Area.

6.3. The proposed changes to the current plan are summarised in Table 2 below:

Table 2 Summary of proposed changes

Zone	Existing Rules		Proposed Rules	
	Lux on adjoining property (horizontal and vertical) curfew/non-curfew	Lux measured vertical on windows of adjoining households curfew/non-curfew	Lux on adjoining property (horizontal and vertical) curfew/non-curfew	Lux measured vertical on windows of adjoining households curfew/non-curfew
Rural 1	20			
Rural 2	20			
Rural 3	20			
General Rural Zone			1/5	1/2
Rural 4A	5	1		
Rural 4B	20			
Rural Lifestyle Zone			0.5/2	1/2
Rural 5		1		
Dark Sky Overlay			0/1	0/1
Residential 1-6	10/20			
General Residential Zone			2/10	2/5
Medium Density Residential Zone			2/10	2/5
Settlement Zone			0.5/2	1/2
Commercial Zones	10/20		5/25	3/15
Industrial Zones	10/20	1/10	5/25	3/15
Recreation	10/20	1/10		
Sports and Active Recreation Zone			5/25	1/15
Open Space Zone			1/5	1/2
Natural Open Space Zone			0/1	0/1

6.4. Generally, illuminance levels at the boundary and window are reduced, especially during the curfew period, but are considered readily achievable with good design

particularly with the use of LED lighting which generally has more tightly controlled distribution.

- 6.5. A rule requiring lighting to be directed away from roads and adjoining properties is retained but the same wording is applied across all zones. While this rule poses some practical challenges, we favour it over the approach taken in the Auckland Unitary Plan and AS/NZS4282-2019 given the technical difficulty for the property owners and Council to determine compliance.
- 6.6. A rule requiring lighting in any industrial, commercial or recreation zone to limit the effects of glare on road users is introduced. This is only applied to the industrial, commercial or recreation zones given the need for calculations to be performed to determine compliance and that high intensity lighting that is likely to create glare is most likely to exist in these zones. In the rural and residential zones, the rule discussed in 6.5 above will provide adequate control of the effects of glare on road users.
- 6.7. A rule is introduced to limit the intensity or “brightness” of lighting installations on building facades and signs. While these rules require calculation to demonstrate compliance, they will most likely only be needed by commercial property owners who would generally be using some form of professional lighting design.
- 6.8. A Dark Sky Protection area is introduced which requires lighting within the area to be fully shielded and with a CCT of 3000K or less. Further controls are also added for illuminated signs.
- 6.9. We do suggest consideration could be given to adding a guidance/good practice section (similar to Christchurch City Council) that would assist readers of the plan in understanding the lighting requirements and make good lighting decisions.

Appendix 1: Proposed Lighting Rules for the Timaru District Plan

Background

Artificial lighting enables work, recreation and entertainment activities to occur beyond normal daylight hours. It also provides additional safety and security to sites and associated activities. However, unless used with care, it can adversely affect adjoining properties through light spill and glare.

Where lighting is poorly designed, selected, controlled or aimed, light pollution may result which causes adverse changes to the view of the night sky and has potential to disturb wildlife. There may also be potential impacts to human health.

The provisions for artificial light provide for adequate lighting to support activities and enable safety and security for participants, while minimising potential adverse effects.

Objectives

- (1) Artificial lighting enables outdoor activities and the security and safety of people and property.
- (2) The adverse effects of outdoor lighting on the environment and safety of road users are limited.

Policies

- (1) Provide for appropriate levels of artificial lighting to enable the safe and efficient undertaking of outdoor activities, including night time working, recreation and entertainment.
- (2) Control the intensity, location and direction of artificial lighting to avoid significant glare and light spill onto adjacent sites, maintain safety for road users and minimise the loss of night sky viewing.
- (3) Use area or activity specific rules where the particular functional or operational needs of the area or activity make such rules appropriate.

General standards

- (1) Lighting limits must be measured and assessed in accordance with Standard AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting. In the

event of any conflict between Standard AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting and the lighting standards set out below, the lighting standards set out below shall prevail.

(2) Any calculation for the purposes of these standards must be based on a maintenance factor of 1.0 (i.e. no depreciation).

(3) For the purposes of determining the non-curfew and curfew illuminance limits at the boundary and a window, the lighting category classification for each zone in *Table A Lighting category classifications* will apply. Where a development is located on a site which adjoins or is directly across a road from a different lighting category, the most sensitive classification of the two categories will apply.

(4) Where measurements of any illuminance above background levels from the use of artificial lighting cannot be made because the artificial lighting cannot be turned off, measurements may be made in areas of a similar nature that are not affected by the artificial lighting. The result of these measures may be used for determining the effect of the artificial lighting.

(5) For the purposes of these standards, the curfew time is 10pm - 7am and the non-curfew time is 7am – 10pm.

(6) The added illuminance from the use of any artificial lighting on any site must not exceed either:

- (a) the levels in Table B Horizontal and vertical illuminance at a boundary, when measured at the boundary of any adjacent site containing a lawfully established dwelling. The illuminance limit will apply horizontally and vertically at any point on the boundary and at any height; or
- (b) the vertical illuminance limits in Table C Vertical illuminance at a window, when measured or calculated at the windows of habitable rooms of a lawfully established dwelling.

Table A: Lighting category classifications

Zone	Lighting Category				
	Lighting category A1 (Intrinsically Dark)	Lighting category A1 (Dark)	Lighting category A2 (Low brightness)	Lighting category A3 (Medium brightness)	Lighting category A4 (High brightness)
General Rural Zone			●		
Rural Lifestyle Zone		●			
Dark Sky Overlay	●				
General and Medium Density Residential Zone				●	
Commercial					●
Industrial					●
Sports and Active Recreation Zone					●
Open Space Zone				●	
Natural Open Space Zone	●				

Table B Horizontal and vertical illuminance above the background level at a boundary

Time	Lighting Category				
	Lighting category A0 (Intrinsically dark)	Lighting category A1 (Dark)	Lighting category A2 (Low brightness)	Lighting category A3 (Medium brightness)	Lighting category A4 (High brightness)
Non-curfew	1 lux	2 lux	5 lux	10 lux	25 lux
Curfew	0 lux	0.5 lux	1 lux	2 lux	5 lux

Table C Vertical illuminance at a window

Zone	Lighting Category				
	Lighting category A0 (Intrinsically dark)	Lighting category A1 (Dark)	Lighting category A2 (Low brightness)	Lighting category A3 (Medium brightness)	Lighting category A4 (High brightness)
Non-curfew	1 lux	1 lux	2 lux	5 lux	15 lux
Curfew	0 lux	0 lux	1 lux	2 lux	3 lux

(7) Outdoor artificial lighting operating on any site in an industrial, commercial or recreation zone between sunset and sunrise must not exceed the threshold increment limit stated in Table D Threshold increment, on any public road, calculated within each traffic lane in the direction of travel.

Table D Threshold increment

Light technical parameter	Threshold increment limit for each lighting category				
	Lighting category A0 (Intrinsically dark)	Lighting category A1 (Dark)	Lighting category A2 (Low brightness)	Lighting category A3 (Medium brightness)	Lighting category A4 (High brightness)
Threshold increment (TI)	15 per cent (based on adaption luminance of 0.1 cd/m2)	15 per cent (based on adaption luminance of 0.1 cd/m2)	15 per cent (based on adaption luminance of 1 cd/m2)	15 per cent (based on adaption luminance of 2 cd/m2)	15 per cent (based on adaption luminance of 10 cd/m2)

(8) All exterior lighting shall be directed away from adjacent roads and properties.

(9) The average surface luminance measured in candelas per square metre (cd/m2) for an intentionally artificially lit sign, artwork or building façade shall not exceed the limits as set in *Standard AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting Clause 3.3.5 Lit surfaces*.

Specific Rules Dark Sky Protection Area

(1) In addition to compliance with the illuminance requirements for the zone in which the site is located, all exterior lighting (including street lights) within the Dark Sky Protection Area with an initial lamp lumens³ of greater than 500 lumen must:

- a. be fully shielded⁴ and directed/aimed in such a way that no light is emitted above the horizontal plane passing through the lowest light-emitting portion of a fixture.
- b. have a colour corrected temperature of no greater than 3000K (warm white)
- c. make use of timers and/or motion sensors, dimmers or other controls to minimise the operation or output of the lights between 10pm and 7am the following day

(2) Any illuminated sign (excluding traffic safety/warning signs) if operated during curfew must:

- a. be a single colour on a black background
- b. the illuminated area of the sign must not exceed 3m²

Assessment – controlled activities

There are no controlled activities in this section.

Assessment – restricted discretionary activities

Matters of discretion

The Council will restrict its discretion to all of the following matters when assessing a restricted discretionary activity resource consent application:

- (1) the effects of lighting on traffic safety; and
- (2) the effects of artificial lighting and glare on the amenity values and the character of the neighbourhood.

Assessment criteria

The Council will consider the relevant assessment criteria for restricted discretionary activities from the list below:

- (1) for traffic safety:
 - a. the extent to which any artificial lighting will adversely affect traffic safety;

³ “Initial lamp lumens” is defined as the number of lumens of light emitted by a lamp when new and not counting any depreciation of output due to the age of the lamp. This information can be found in manufacturer data sheets.

⁴ “Fully shielded” is defined such that that the light source is screened and its light directed in such a way that none is emitted above the horizontal plane passing through the lowest light-emitting portion of a fixture.

- (2) for the effects of artificial lighting and glare on amenity values:
- a. whether the number, type, placement, design, height, correlated colour temperature (CCT), orientation and screening of light fittings and light support structures minimises light spill, glare, and loss of night time viewing;
 - b. the extent to which the amount of light falling beyond the site during the hours of darkness is minimised to control effects on indoor amenity values and sleep quality; and
 - c. whether the artificial lighting is necessary, suitably designed and adequately protects the amenity and ecological values of the surrounding environment.

Comment on Draft Signs Chapter (illuminated signs)

1. The proposed sign rules are shown below.
2. Sign S-2 (1) states *“Illuminated, moving, flashing or digital display sign must not display a digital or pre-recorded broadcast.”*
 - a. I would have thought every digital sign is by nature displaying a digital or pre-recorded broadcast?
3. Sign S-2 (4) states *“No illuminated, moving, flashing or digital display sign must be visible from and/or located within 50 metres of a Residential zone”.*
 - a. Are illuminated signs prohibited in the rural zones? If not, it would be desirable to avoid such signs in the dark and intrinsically dark areas of the district in my opinion.
 - b. Consideration should be given to the impact of this rule on digital scoreboards in the Sport and Active Recreation Zones which will likely be near residential areas. These could be permitted to operate in the non-curfew hours?
4. Sign S-2 (4) states *“Signage illuminated levels shall not exceed the maximum luminance as set out in Table ?.”*
 - a. *“illuminated”* refers to *illuminance* (the amount of light falling on a surface) whereas the table refers to *luminance* (the intensity of light in a particular direction). It would be more correct to state *“Signage luminance levels shall not exceed the maximum luminance as set out in Table ?.”*
 - b. The levels set in the table are considered “very bright” and are between 400cd/m² and 2000 cd/m². The IDA notes *“As of 2019, it is common Electronic Messaging*

Centres (EMCs) to operate in daytime at luminances in excess of 5000 candelas per square meter (cd/m²). Such high luminances are necessary for visibility due to the high ambient illumination during the day. Achieving proper lighting control at night requires dimming of the LEDs to match the lower ambient illumination and thus render more appropriate visibility. However, sufficient dimming at night is infrequently implemented, resulting in over-lighting, decreased sustainability, and attendant environmental impacts.

- c. The IDA guidelines on Electronic Messaging Centres sets a maximum luminance of 160 cd/m² in the high brightness zones. It may be beneficial to only set a luminance limit during the hours of darkness and make this limit conservative. The Auckland Unitary Plan sets the following limits:

(2) If lit internally or by external means (excluding digital billboards) a billboard must:

(a) not be lit with an upwardly facing light source;

(b) not exceed a luminance of 800cds/m² when lit by an artificial light source between dusk and dawn; or

(c) be designed to reduce any glare or direct view of the light source when viewed by an observer at ground level 2 metres or more away from the billboard.

(3) A digital billboard must include controls to ensure luminance does not exceed:

(a) 5000cds/m² between sunrise and sunset; (daytime)

(b) 250cds/m² between sunset and sunrise (night time); and

(c) 250cds/m² during twilight; (twilight means from astronomical dawn to sunrise and from sunset until astronomical dusk with the times for sunrise, sunset and astronomical dusk (night) being those specified in the US Naval Portal).

5. I would suggest adopting the following:

(2) If lit internally or by external means (excluding digital billboards) a billboard must:

(a) not be lit with an upwardly facing light source;

(b) not exceed a luminance of 800cds/m² when lit by an artificial light source between dusk and dawn; or

(c) be designed to reduce any glare or direct view of the light source when viewed by an observer at ground level 2 metres or more away from the billboard.

*(3) A digital billboard must include controls to ensure luminance does not exceed:
(a) 5000cds/m² between sunrise and sunset; (daytime)*

(b) 250cds/m² during twilight; (twilight means from astronomical dawn to sunrise and from sunset until astronomical dusk with the times for sunrise, sunset and astronomical dusk (night) being those specified in the US Naval Portal).

(c) during curfew hours not exceeding 160 cd/m² in commercial and industrial zones

(3) the measurement of luminance shall be initial values and may be from the manufacturers photometric testing data, by calculation or my site measurement. Post installation site luminance measurements shall be of a white screen at the programmed night-time intensity level and be taken perpendicular to the sign and aimed at the centre of the sign under clear sky conditions during daylight, twilight and curfew time.

SIGN-S2 Illuminated, moving and flashing signage

<p>All zones</p>	<ol style="list-style-type: none"> 1. Illuminated, moving, flashing or digital display sign must not display a digital or pre-recorded broadcast. 2. Any illuminated, moving, flashing or digital display sign shall only display still images, and where multiple still images are displayed, each still image must be displayed for a minimum of seven seconds each before changing to a different still image. 3. No illuminated, moving, flashing or digital display sign must be visible to vehicles travelling on a legal road within 100 metres of an intersection. 4. No illuminated, moving, flashing or digital display sign must be visible from and/or located within 50 metres of a Residential zone. 5. Where attached to a building, no illuminated, moving, flashing or digital display sign must be visible beyond the building above ground floor level. 6. No illuminated, moving, flashing or digital display sign shall create more than 10.0 lux spill (horizontal and vertical) of light when measured or calculated 2 metres within the boundary of any adjacent site or non-local road. 7. Signage illuminated levels shall not exceed the maximum luminance as set out in Table 2 <p>Table 2 #TBC Maximum luminance of externally or internally illuminated signs:</p> <table border="1" data-bbox="553 1465 1161 1808"> <thead> <tr> <th>Illuminated area (m2)</th> <th>Areas with street lighting</th> <th>Areas without street lighting</th> </tr> </thead> <tbody> <tr> <td>Up to 0.5</td> <td>2000</td> <td>1000</td> </tr> <tr> <td>0.5 to 2.0</td> <td>1600</td> <td>800</td> </tr> <tr> <td>2.0 to 5.0</td> <td>1200</td> <td>600</td> </tr> <tr> <td>5.0 to 10.0</td> <td>1000</td> <td>600</td> </tr> <tr> <td>Over 10.0</td> <td>800</td> <td>400</td> </tr> </tbody> </table> <p>Note: All luminance in the table are in candelas per square metre.</p>	Illuminated area (m2)	Areas with street lighting	Areas without street lighting	Up to 0.5	2000	1000	0.5 to 2.0	1600	800	2.0 to 5.0	1200	600	5.0 to 10.0	1000	600	Over 10.0	800	400	<p>Matters of discretion are restricted to:</p> <ol style="list-style-type: none"> 1. The frequency and intensity of flashing and/or image change; and 2. Extent of illumination when visible from a public place; and 3. Impact on surrounding activities, including their context; and 4. Amenity of the surrounding environment.
Illuminated area (m2)	Areas with street lighting	Areas without street lighting																		
Up to 0.5	2000	1000																		
0.5 to 2.0	1600	800																		
2.0 to 5.0	1200	600																		
5.0 to 10.0	1000	600																		
Over 10.0	800	400																		