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Prepared for: Hearing Commissioners – Te Tai o Poutini Plan
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Date: 28 November 2023
Subject: **Lighting**

Purpose of Report

1. The purpose of this report is to respond to questions raised by the Hearings Panel during Hearing - General District Wide Matters which relate to lighting, and to recommend further amendments to the notified version of the Proposed District Plan.

Hearing Panel's Questions to the s42a Reporting Officer and their response

2. The following questions were received from the Hearing Panel for the General District Wide Matters topis which sat on the 14th of November 2023.

[1] Whether mining activities in the General Rural and Special Purpose Mineral Extraction zones are sufficiently controlled under LIGHT-R4

3. The difficulty with LIGHT R4 as currently written is that is sets illuminance limits for the General Rural Zone, Special Purpose Mineral Extraction zone **and** the General Residential Zone which are likely to occur very different receiving environments with different ambient light conditions.

4. AS4282:2023 Table 3.2 recommends the following vertical illuminance limits. The limiting values specified for illuminance (lux) and upward lightspill "takes account of land use zoning, which in part, reflects the function of lighting, and the existing and future level of night-time activity to be expected in the area"[1] These limits consider:

    - Effects on residents
    - Effects on transport system users
    - Cultural impacts
    - Impact on flora and fauna
    - Impact of the spectral context of the light
    - Effects on the natural environment

[1] AS4282:2023 3.2.3 Basis for differentiation of limits according to area type.

5. Different limits are applied based on ambient light conditions.

Environmental Zone	Ambient Light Conditions/Examples	Non-Curfew lux	Curfew lux	Upward Light Ratio Max ULR
A0	Intrinsically Dark, IDA Dark sky reserves etc	0	0.0	0.00
A1	Dark – Relatively uninhabited rural and coastal areas	2	0.1	0.00
A2	Low District Brightness – Sparsely inhabited rural and semi-rural areas	5	1	0.01
A3	Medium District Brightness – Suburban areas in towns and cities	10	2	0.02
A4	High District Brightness – Port, Industrial, town centres	25	5	0.03

6. Mining activities are most likely to occur in Environmental zones A1 – A2. The proposed limit of 10 lux during non-curfew and 2 lux during curfew would be normally associated with lighting limits in residential zones in suburban areas in towns and cities.

7. I consider that mining activities in the General Rural and Special Purpose Mineral Extraction zones would be sufficiently controlled if illuminance limits were reduced to a maximum of 5 Lux curfew and 1 lux non-curfew and ideally 2 Lux curfew and 0.1 lux non-curfew consistent with environmental zone A1.

8. I note that AS4282:2023 requires the measurement of illuminance generally at the building line of a dwelling on an adjoining site, and where no dwelling exists at the setback required under the zone for a new dwelling, and where this has not be defined at a distance of 10m inside the boundary of the adjoining site.

9. LIGHT-R4 does not include any control on upward light. AS4282 recommends a maximum upward light ratio of 0 (no upward light spill) in environmental zones A1 and 0.01 (1%) in A2.

10. It would be in accordance with best practice to consider upward light spill controls for mining activities noting that these limits should not apply to “vehicle lights, including

working lights mounted on moving vehicles and plant" which are exempt under AS4282:2023.

[2] Management of light in light sensitive areas

10. I have considered the management of light in light sensitive areas and the requirements of LIGHT-R2, LIGHT-R3, and LIGHT-R4. I suggest consideration be given to better alignment with the recommendations in AS4282:2023 based on the consideration of the intrinsic light conditions likely to be present in particular zones.

11. If the current rules were aligned more fully with AS4282:2023 the proposed levels would be as follows:

Rule	Environmental Zone	Non-Curfew Lux	Curfew Lux	Upward Light Spill
Light R2 - Artificial Outdoor Lighting in the TCZ - Town Centre, MUZ - Mixed Use, COMZ - Commercial, PORTZ - Port, HOSZ - Hospital, STADZ - Stadium, AIRPZ- Airport and all INZ - Industrial Zones	A4 - High District Brightness – Port, Industrial, town centres	25	5	0.03
LIGHT - R4 General Residential	A3 - Medium District Brightness – Suburban areas in towns and cities	10	2	0.02
LIGHT – R4 General Rural	A2- Low District Brightness – Sparsely inhabited rural and semi-rural areas	5	1	0.01
LIGHT - R3 Artificial Outdoor Lighting in the NOSZ - Natural Open Space Zone, SETZ - PREC 3 2 - Settlement Zone - Coastal Settlement Precinct, and in All Zones where the site falls within the Outstanding Coastal Natural	A1 - Dark – Relatively uninhabited rural and coastal areas	2	1	0.00

Character Overlay, Outstanding Natural Landscapes Overlay and Outstanding Natural Features Overlay				

10. General residential would typically occur in an area of medium district brightness where the recommended lux levels are 10 lux non-curfew and 2 lux curfew. I note the lux levels under LIGHT-R4 are appropriate. The current levels in LIGHT - R2 of 25 lux non-curfew and 10 lux curfew would in my view be too high if applied to residential activities.

11. General Rural would typically occur in areas described as "Dark – Relatively uninhabited rural and coastal areas" or "Low District Brightness – Sparsely inhabited rural and semi-rural areas". Based on the current lux levels within the Light chapter, the levels in LIGHT - R3 of 2 lux non-curfew and 1 lux curfew would be more appropriate for the General Rural Zone.

[2c] Whether LIGHT-R3 affords sufficient dark sky protection in Okarito

12. Assuming that LIGHT-R3 applies to the area under consideration for dark sky accreditation, I consider that the lux limits within this rule would provide sufficient dark sky protection, however note LIGHT-R3 2.a and LIGHT-R3 2.b which controls upward light spill and colour temperature would also need to apply to the Okarito Settlement in order to provide sufficient dark sky protection.

13. Consideration could also be given to including a standard that requires lights emitting greater than 500 lumens to be controlled by motion-activated switches limiting the duration of illumination to less than five (5) minutes after activation between the hours of 10pm and 7am.

14. These changes would enable the use of controlled light between 10PM and 7AM, would be more aligned with AS4282:2023 and dark sky guidelines.

4. Management of reflectivity and glare

15. Glare is the term used to describe a condition of vision causing discomfort. Glare is a relative term as it is influenced by the relative brightness of the surrounds, the individuals sensitively to light and the design of the light source.

16. Intensity of light from a light source measured in a particular direction is defined as luminance. It is measured in Candela and can be calculated for the known position of the

observer using computer software if the properties of the light source are known. It can also be measured using a luminance meter. A luminance meter is a specialised piece of equipment and can be hired (I am aware of only one luminance meter available for hire in New Zealand). This is not to be confused with an illuminance meter which are commonly available and measure illuminance (lux) or the amount of light falling on a surface.

17. Planning rules typically do not consider luminance (I) other than for illuminated signs. In order to set rules, it is necessary to define where measurements will be taken from relative to the light source.

18. As glare is a relative term and difficult to measure practically, I do not recommend inclusion of rules in the plan to limit intensity in LIGHT.

19. The amount of upward light spill created by light reflecting of surfaces will depend on the reflecting properties of the surface lit. Generally, the reflected illuminance with be lower where natural grass or dark asphaltic surfaces are lit, but may be significant where it is light in colour such as new, unfinished concrete. The reflectivity will change if the surface is wet and may change seasonally. Given the number of variables it is not considered practical to develop rules to address reflectivity. Good lighting design would consider these factors.

5. The use of light management plans in light sensitive areas

20. I have recommended the use of Light Management Plans as a means to introduce a greater level of professional input to mitigate the effects of light with a given lighting application in a specific environment.

21. A light management plan seeks to control and optimise the use of artificial lighting in a specific environment including meeting the specific operational requirements of the activity. It aims to enhance energy efficiency, minimise light pollution, protect biota and create a safe and functional lighting scheme tailored to the needs of the space or area.

22. A light management plan may for example propose more light than is permitted under the LIGHT rules but managed in a better way, for example using very warm light sources or even no light during avian breeding seasons but higher light levels during ship loading outside of breading season.

23. A light management plan would be a useful means of supporting any resource consent application under LIGHT – R5 for restricted Discretionary Activities or R6 Discretionary.

6. Other

24. I note the LIGHT R2/R3/R4 all include the measurement of illuminance in the horizontal plane unlike AS4282:2023 which only measures illuminance in the vertical plane. I recommend that LIGHT R2/R3/R4 be amended to only consider vertical illumination.

Nā māua noa, nā

Paul Wilson
Director