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Attn: Simon Berry

Re: Bekon Media application to authorise a proposed digital billboard at 332 Queen Street, Richmond
Night light / 'Dark sky' effects

1. You have sought my opinion in relation to concerns raised by submitters on the above application in relation to potential adverse lighting effects, including effects on Wai-iti Dark Sky Park, located south of Richmond. In that regard, it is hoped that, if these lighting effects are found to be acceptable, it may be possible to address these submitters' issues ahead of the hearing of the application.

Lighting-related submissions

2. Other than the submission by Waka Kotahi, nine of the submissions lodged on the application mention lighting or illuminance. Several others refer to adverse visual effects, which I have assumed may include concerns about the lighting element of the proposed billboard. The relevant submissions comprise the following:

(a) #8 - Bruce Struthers;

(b) #10 - Tim Leyland;

(c) #12 - Ralph Bradley;

(d) #16 - Thomas Wilson;

(e) #17 - Sean Walker;

(f) #20 - Jenny Pollock;

(g) #22 - Brent Nicholls;

(h) #24 - Gordan & Gaye Waide; and

(i) #25 - Elizabeth Dooley.

My analysis / comments – dark sky issues

3. I have analysed all of the submissions in light of all relevant standards and my expertise in lighting. As requested, this opinion focusses Submissions 8, 12, 16 and 20 which refer to dark sky issues. I make the following comments in that regard.

Submission #8 – Mr. Struthers

4. Bruce Struthers' submission (#8) suggests that shielding be installed above the billboard to shelter the night sky.

5. I understand what Mr. Struthers is seeking to achieve; however, that objective will be met by an "eyebrow" (see picture below) that will be built into each individual LED above the light source. Their primary purpose is to address direct sunlight "washing out" images but their effect will also be to provide a shield to reduce upward light spill. In light of this feature, a larger shield located above the billboard would not in my opinion improve the upward light screening.

Zoomed in image of LED's and eyebrows
LED's are at 10mm centres

6. In response to Mr. Struthers comments, I note that the proposed billboard will incorporate an ambient light sensor to automatically adjust the LED by dimming the output on dull and overcast days and at night. Spill light will be negligible from the very low wattage LEDs. It is acknowledged that the digital images could be seen from a distance but, in my opinion, if they are controlled as I have recommended, they will not appear bright.

7. On the assumption that Mr. Struthers may have adopted as his point of reference the Go Media digital billboard near Nelson Airport, I note that it appears that the luminance controls on that billboard have not been set correctly with the result that the nighttime limit is operating at 592cd/m^2 and daytime is 5,210cd/m^2, both of which are significantly above the luminance that would be expected. Consequently, this billboard is not a good example to base comments regarding sky glow, bright billboards and light pollution on.

8. This example is also relevant in considering Mr. Struthers' submission to the extent that it states that LEDs continue to increase in their intensity so are capable of providing very bright impressions.

9. Lastly, I note that images will be programmed to change with a "soft" transition of 0.5 second to eliminate flicker effect and are therefore not considered to change quickly as Mr. Struthers has assumed.

Submission #12 – Mr. Bradley

10. Ralph Bradley is the Chair of the Top of the South Dark Sky Committee. His submission refers to a document issued by the International Dark-Sky Association ("IDSA") titled "Guidance for Electronic Message Centres (EMCs)" (May 10, 2019). The IDSA is a private environmental organisation based in Tucson, Arizona which has the objective of "empowering a global movement to protect the night sky."

11. EMCs are defined to include "LED signs," LED displays and "digital billboards". That document identifies five "overlay lighting zones" (LZs), ranging from LZ0 (no ambient lighting) through to LZ4 (high ambient lighting), and sets nighttime maximum luminance levels based on the level of ambient lighting in an area in accordance with the following table:[1]

Lighting Zone	Nighttime Maximum Luminance (cd/m2)
LZ0	0
LZ1	20
LZ2	40
LZ3	80
LZ4	160

12. Mr. Bradley considers that the area in the vicinity of the application site has moderately high ambient lighting so that, based on the above table, billboard luminance should be limited to 80cd/m^2 at night.

13. The IDSA's guidelines, etc., have no legal standing in New Zealand. In assessing appropriate levels, lighting experts in New Zealand apply the Standard "AS/NZS 4282 Control of the obtrusive effects of outdoor lighting" and it has similar lighting categories contained in Table 3.1 where A3 refers to medium district brightness in suburban areas in towns and A4 is described as high district brightness in town and city centres and other commercial areas. Table 3.4 then recommends a maximum average luminance limit of 250cd/m^2 for A3 and 350cd/m^2 for A4 zones.

14. Lighting Category A2 in the same Standard is tabulated as 150cd/m^2 maximum average and it is used in low district brightness areas; however, the Standard also contains a recommendation that Lighting Category A2 be applied where the lit surface is viewed against a dark background such as would be the case in Richmond. I have recommended a maximum nighttime luminance limit of 125cd/m^2 which I consider will adequately address any concerns in that regard[2]. This recommendation has been accepted by Bekon Media and will be included in the proposed conditions of consent promoted by Bekon.

15. In my opinion, adopting the maximum average limits as set out in AS/NZS 4282 in the context of this application would not provide a good outcome in terms of luminance / glare. In that regard, I have consistently interpreted the tabulated luminance values in the Standard as representing maxima when an image could have all sorts of colours on it. In my opinion, best practice dictates that white should be adopted as the brightest image to be displayed and that that value should be within those limits for nighttime operation, as a worst-case scenario.

16. Glare arises where there is a discomfort or a reduction in the ability to see, caused by an unsuitable contrast of luminance such as a viewing bright billboard against the dark night sky. The key is to reduce the billboard luminance to ensure one's eye does not have to cope with a high contrast. Typical digital billboards I have tested in New Zealand range from 40cd/m^2 to 135cd/m^2 depending on the advertising image and colours used. Some images do not use white and instead have darker tones as an example.

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1 International Dark-Sky Association "Guidance for Electronic Message Centres (EMCs)" (May 10, 2019), page 8.

2 For clarity, I note that luminance is measured either in Nits or cd/m2, both of which have the same value.

17. Even though the limit might be set at 125cd/m^2, the luminance of the images will be lower than that, based on tested billboards throughout New Zealand.

18. If I were to apply the IDSA's guidance, I would place downtown Richmond as an area with moderately high ambient lighting in respect of which the guideline would require a maximum nighttime luminance of 80cd/m^2. The 125cd/m^2 that Bekon Media proposes based on AS/NZS 4282 is close to that maximum and is more appropriate for the area noting existing static signage in the area has a luminance reading ranging from 152cd/m^2 on the Black Bull Liquor sign up to 960cd/m^2 on the Z service station fuel pricing display.

19. I visited the Dark Sky Park at 437 Wakefield-Kohatau Highway on Saturday, 16 September between 1.30pm and 2.30pm and again between 7.00pm and 7.45pm. I noted that the reserve area is surrounded by tall trees and the rest of the park is used as a working forest.

20. On the night of my visit, the weather was very cloudy which provides a body for artificial uplighting to reflect off. There was evidence of reflected light in the sky at that time. I note that the outcome would be significantly different if it had been a clear night with no cloud to reflect uplighting.

21. I consider that an observer in the Dark Sky Park would not be affected by sky glow on a clear night given the 20km distance from Richmond, the valley that the park is situated in and the surrounding hills between Richmond and the dark sky park. The nearest streetlights of any quantity are located in Wakefield, being approximately 5km away from the reserve.

Submission #16 – Mr. Wilson

22. Mr. Wilson's submission suggests that the proposal will damage Dark Sky conservation efforts in the Wai-iti Dark Sky Park.

My comments in relation to Mr. Bradley's submission equally apply to Mr. Wilson's submission.

23. In my view, the luminance limits proposed, automated controls and "eyebrows" described above will all assist to mitigate potentially obtrusive lighting effects, particularly at night. I have recommended that a monitoring condition is included to ensure the maximum luminance limits are not exceeded and this has been included in Bekon's proposed conditions. It is my expectation based on my previous history with Bekon Media that nighttime luminance will be even lower than the proposed limits.

Submission #20 – Ms. Pollock, Nelson Science Society

24. Ms. Pollock is the President of the Nelson Science Society. Her submission indicates that she is concerned about the increasing light pollution that is reducing darkness in the Tasman District.

Again, my comments in relation to the above submissions apply here.

25. As noted above, I consider that the controls and features that will be included in the proposed billboard will ensure that the proposed billboard will not add to light pollution in Richmond. In that regard, it is important to note that there is a 20km separation between the proposed billboard and the Dark Sky Park at 437 Wakefield – Kohatu Highway. The effects of the billboard will be negligible over that distance, particularly given the topography in the area that separates the two sites.

26. Light pollution is typically caused by poorly oriented and aimed floodlights that have a high upward light component. An example of this is the Carter Holt Harvey Mill site between Richmond and the Dark Sky Park.

Key conclusion

27. I have recommended that nighttime luminance should be set at 125cd/m^2, which is lower than that specified in the application documents but is accepted by Bekon Media. My recommendation will result in roughly half of the luminance of the original proposal per the application as lodged, with lower day and nighttime maximum limits. (Submitters should not be confused by maximum average limits, the limits noted should be read as maximum limits.)

28. In my opinion, there is no sound technical basis for concerns about adverse lighting effects arising as a result of the brightness of the proposed billboard, particularly in relation to Richmond's dark sky.

29. I am happy for you to present these findings to the relevant submitters and to engage with them as necessary, with a view to allaying their fears and addressing their concerns.

30. Please get in touch if you require further clarification.

On behalf of
Kern Consultants Ltd

Russ Kern MIES