

From: Christopher Lidman
To: Steve Coyne: "gillian"
Cc: Christopher Lidman; Brian Cole
Subject: Re: Lighting report
Date: Tuesday, 12 November 2019 5:53:31 PM
Attachments: [image002.png](#)
[image003.png](#)

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Dear Steve, Gillian,

Thank you for your time on the phone

You've answered all my queries very well. For completeness, I added some additional comments

- It is likely that the night sky brightness at azimuth angle 65 degrees was affected by Zodiacal light. The following tool <https://in-the-sky.org/skymap.php> can be used to map out the ecliptic (Zodiacal light follows the ecliptic) and the plane of the galaxy, the two biggest sources of natural background light above that produced by the Earth's atmosphere. During the night, these components will change their location in the night sky as the Earth rotates. Hence, we believe that the natural night sky brightness without these two components is best represented by the measurements made at an azimuth angle of 315 degrees.

I understand the reasons you chose an azimuth angle of 65 degrees as the reference. Looking at the orientation of Taurus and Pleiades in Fig 7 and Fig 8, I estimate that these images were taken around 1 am at the beginning of September. Here is a direct link to the view that was imaged: https://in-the-sky.org/skymap.php?no_cookie_1&latitude=-31.25&longitude=149.20&timezone=10.00&year=2019&month=9&day=1&hour=1&min=0&PLimitmag=2&zoom=166&ra=3.08952&dec=10.60846

At that time, the ecliptic was at an altitude of 17 degrees above the horizon at an azimuth 55 degrees. The angle of the Zodiacal light with respect to the horizon would have not been too different from the image shown in the attached photo. The intensity of the Zodiacal light decreases as you move away from the sun. The one exception is the *Gegenschein*, which I have always wanted to see but haven't. My eyesight is not as good enough now.

Even with the uncertainties, it is clear that the current lights from the Boggabri mine lies below the 10% threshold at an altitude of 30 degrees. Indeed, the little bump at an altitude of 20 degrees in Fig 15, may be the Zodiacal light. If one were to remove that, then the 10% threshold is reached when the altitude is 15 degrees, and we do not point telescopes that low in the sky.

Of course, it is the sum of all sources, not just a single source that contribute to the night sky brightness above SSO. Hence, I am not concerned by a single mine like Boggabri, but I'd be worried if there were 10 of them.

- We anticipate that the red dotted curve in Fig 18 consists of natural and anthropogenic sources. How much of the increase towards lower altitudes is due to the natural increase with decreasing altitude?

I understand that red dotted line is the sum of the anthropogenic source used in the model plus a constant background. This seems to be a limitation of the software, as I would expect that most of the increase between 90 degrees and 20 degrees is entirely natural.

- There are four dotted curves in Fig 19. It was not clear from the caption or the text what distinguishes these four curves.

You explained this well enough. I blame my failing eyesight for not interpreting this plot correctly the first time.

- The report notes a total luminous flux of 6.96×10^6 lumens and that 24% of that (1.67×10^6 lumens) would be directed upwards. On page 23, it seems that the total luminous flux was used in the Sky Glow software. Does the Sky Glow software take into account that only 24% of total luminous flux is directed upwards?

Thank you for explaining what you did over the phone. Perhaps you could add an additional bullet to the bullets on page 23, noting that you did account for light that was emitted upwards.

Thanks again for the report. It is really very good.

You are welcome to visit SSO anytime.

Regards,

Chris

[/var/folders/ky/b_430yq534g_3297jngll80000gn/T/com.microsoft.Outlook/WebArchiveCopyPasteTempFiles/steves-19.jpg](#)



*Professor Chris Lidman
Director, Siding Spring Observatory, Research School of Astronomy and Astrophysics
The Australian National University, Canberra, ACT, Australia*

From: Christopher Lidman
Date: Monday, 11 November 2019 at 4:18 pm
To: Brian Cole; Steve Coyne
Cc: Christopher Lidman
Subject: Re: Lighting report

Hi Brian, Steve,

The SSO Dark Sky Committee has read through the report, and have provided the following feedback:

Overall, the report is excellent, both in the way it is written and the technical information that it contains. It is clear, concise, and easy-to-follow.

Comments are mostly of a technical nature.

- It is likely that the night sky brightness at azimuth angle 65 degrees was affected by Zodiacal light. The following tool <https://in-the-sky.org/skymap.php> can be used to map out the ecliptic (Zodiacal light follows the ecliptic) and the plane of the galaxy, the two biggest sources of natural background light above that produced by the Earth's atmosphere. During the

night, these components will change their location in the night sky as the Earth rotates. Hence, we believe that the natural night sky brightness without these two components is best represented by the measurements made at an azimuth angle of 315 degrees

- We anticipate that the red dotted curve in Fig. 18 consists of natural and anthropogenic sources. How much of the increase towards lower altitudes is due to the natural increase with decreasing altitude?
- There are four dotted curves in Fig. 19. It was not clear from the caption or the text what distinguishes these four curves.
- The report notes a total luminous flux of 6.96×10^6 lumens and that 24% of that (1.67×10^6 lumens) would be directed upwards. On page 23, it seems that the total luminous flux was used in the Sky Glow software. Does the Sky Glow software take into account that only 24% of total luminous flux is directed upwards?
- We acknowledge the comment that upward light spill could be reduced with best practice light design.

Regards,
Chris

Professor Chris Lidman
Director, Siding Spring Observatory, Research School of Astronomy and Astrophysics
The Australian National University, Canberra, ACT, Australia

From: Brian Cole [redacted]
Date: Friday, 1 November 2019 at 11:19 am
To: Christopher Lidman [redacted]
Cc: Steve Coyne [redacted]
Subject: RE: Lighting report
Ok by us Chris

Brian Cole
Executive General Manager - Projects Delivery
Whitehaven Coal Limited
PO Box 600
231 Conadilly St, Gunnedah NSW 2380 Australia



From: Christopher Lidman [redacted]
Sent: Friday, 1 November 2019 10:44 AM
To: Brian Cole [redacted]
Cc: Steve Coyne [redacted]; Christopher Lidman [redacted]
Subject: Re: Lighting report

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Dear Brian, Steve,
Many thanks for the report. I'd like to share this report to a couple of technical experts on the SSO Dark Sky Committee. I'd like to make sure that you are comfortable with that.

Regards,
Chris

Professor Chris Lidman
Director, Siding Spring Observatory, Research School of Astronomy and Astrophysics
The Australian National University, Canberra, ACT, Australia

From: Brian Cole [redacted]
Date: Friday, 1 November 2019 at 9:37 am
To: Christopher Lidman [redacted]
Cc: Steve Coyne [redacted]
Subject: FW: Lighting report

Hi Chris,
The report on the Dark Sky implications of Vickery is attached.
I would be interested in any comments.
If you have any particular technical queries, Steve Coyne from Light Naturally has indicated that he is happy for you to contact him for clarification.
Regards

Brian Cole
Executive General Manager - Projects Delivery
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