I am writing this submission on behalf of astronomers who live, operate observatories and conduct research in the Central West of NSW. Thank you for the opportunity to comment on this mine proposal.

We are concerned that this mine, and specifically its lighting, should it go ahead, will contribute significantly to degrading the quality of our regional dark skies and thus threaten local, national and, international tourism to our region.

Regional Councils, such as the Bathurst Regional Council, have been instrumental through development of their Local Environmental Plans in protecting the darkness of our night skies as a major tourism resource. The Plans have led to the Councils improving lighting within their regions. Indeed, Bathurst Regional Council have been progressively installing full cut-off lighting in order to eliminate light travelling upwards illuminating the dust in our atmosphere and thus degrading the darkness of the night sky.

In *Part 8B: Lighting and Sky Glow Assessment* regarding the illumination of the site, the consultants make the claim that "Based on the analysis carried out by LAS the Project can operate on a 24-hour basis without generating excessive light obtrusion to Lue, the area surrounding the Mine Site or the surrounding observatories" (p 9). Further, the Mine Site is stated to be "approximately 168km from the Siding Spring Observatory (SSO) and falls within the Dark Sky Region".

That is a serious situation for observers closer to the mine site than the Australian Astronomical Observatory near Coonabarabran. These passionate observers have specifically located their observatories within the Dark Sky Region, some for research reasons and others to attract tourism, so that they can observe the southern night sky uninterrupted by unwanted sky glow that will be accentuated by dust raised on the mine site.

The suggested mitigation measures on p 8b- p41 will have a serious effect on the night sky of the Central West. The language of "where possible" and "should not be used when not in operation" as they apply to upward facing lighting implies that when it is "not possible" or "when towers are being used at night", the lighting will be directed up at the night sky. That will have a disastrous effect on the work of all astronomers in the region as well as for tourists who have paid to see our dark skies.

Thus, the claims of "no problems" will have a significant effect on the work carried out by local astronomers who now use special cameras that are extremely sensitive to infra-red radiation. Indeed, the dismissal of these local astronomers and their scientific work by misrepresentations of the lighting data and mitigating measures place serious doubt on the calculations included in the document. For example, the statement about the mine site having the "same effect as a full Moon" would be disastrous. This is based on the fact that our observers seldom ever observe at the full-Moon phase because of its light glow. To use that as an example of the minimal effect that mine site lighting would have on the night sky is almost laughable if the situation were not so serious. Light pollution in a dark sky site so very close to the NSW Astronomical Association's dark-sky site near Ilford, a site which is entirely missing from document Part 8b Lighting and Sky Glow Assessment, and is a serious oversight.

Given the recent documents investigating the potential for increasing tourism, both national and international, to the Central West of NSW the goal of which is to "to raise the profile of NSW and DNCO as a *leading* destination for Night Skies experiences which will ultimately drive increased overnight visitation to the region" (p 8). These documents are: *Astrotourism Night Skies Gap Analysis Report 11*

Sept 2019 and the *DNOC Night Skies Concept Plan 2020*. and generated by SMA Tourism, an international tourism consulting firm. (Website: www.smatourism.com)

The SMA Tourism authors of the Gap Analysis also carry the following argument:

> "UNESCO's 2014 thematic initiative 'Astronomy and World Heritage' shows the close relationship between the observation of the firmament and many existing heritage tourism sites, cultural landscapes, and monuments which were reference coordinates of past civilisations. They are places of mystery and wisdom based on the 'knowledge of the stars'. The relevance of these sites, the commemoration of key dates in ancient calendars, and other intangible and oral manifestations are a still largely untapped resource for Night Skies tourism."

Thus, these documents identify the potential to increase tourism substantially to our region. Specifically, the Gap Analysis states, "Night Skies product could generate more visitors, more spend and more jobs to regions" (p 12). In this sense, protecting our night skies has the potential to generate many more and longer-lasting opportunities for employment with concomitant contributions to our local economy than the proposed mine.

For the reasons given above, I do not support the proposed Bowdens Silver Mine. We need to protect our dark night skies to ensure that Australia's highly significant research in astronomy can continue without destroying the very resource that makes us a world leader. Coupled with the long term generation of employment and tourist dollar spend in the region, the protection of our dark skies is supremely important given that the entirely renewable resource of our dark night sky is the only one we have to generate this new form of renewable income for many more people.

Professor David H McKinnon

Bathurst, 2795