BOWDENS SILVER

Part 8b
Lighting and Sky Glow Assessment

State Significant Development No. 5765

Prepared by:

Lighting, Art & Science Pty Limited

May 2020

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BOWDENS SILVER

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Lighting and Sky Glow Assessment

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COMMONLY USED ACRONYMS

AGi32	Lighting Analysts, Advanced Graphical Interface (32bit)
AHD	Australian Height Datum
CCT	Correlated Colour Temperature
DPE	Department of Planning and Environment
HPS	High Pressure Sodium lamp
LAS	Lighting, Art & Science
LED	Light Emitting Diode
LEP	Local Environmental Plan
MH	Metal Halide lamp
RWC	R.W. Corkery & Co. Pty Limited
SSO	Siding Spring Observatory
ULOR	Upward Light Output Ratio
ULR	Upward Light Ratio
WO	Wiruna Observatory

EXECUTIVE SUMMARY

Lighting, Art and Science Pty Limited (LAS) has been engaged by Bowdens Silver Pty Ltd (Bowdens Silver) to assess the potential impact of the Mine Site lighting on the local environment and Siding Spring Observatory.

There is an Australian Standard, AS/NZS4282:2019 Control of the obtrusive effects of outdoor lighting which LAS considers adequately addresses the requirements for dark rural environments with respect to the potential impact on residents in the area surrounding the Mine Site, the impact on the other biota in the area surrounding the Mine Site and the general impact on sky glow.

The Mine Site falls within the Dark Sky Region which consists of the land within a 200 kilometres (km) radius of the Siding Spring Observatory.

LAS has been provided with several scenarios for the lighting of the Mine Site through various times of night and progress through the life of the Mine. LAS has selected the scenario that would have the greatest impact with respect to the obtrusive light and modelled it using AGi32 software.

AS/NZS4282:2019 specifies limits for several lighting parameters. The limits vary according to the Environmental Zones and the time of night. There are 11 different Environmental Zones. LAS has based the assessment on Zone A1, which is the second most stringent, and has assessed both curfew and non-curfew periods.

The analysis indicated that the proposed lighting would fall well within the limits of AS/NZS4282:2019, with the exception of the luminous intensity limits at some viewing angles that are slightly above the limit. This is not relevant in this situation as the distance to the boundaries and surrounding residences is too far to be impacted. This can be further reduced by the addition of shields on some of the lights.

AS/NZS4282:2019 acknowledges that lighting can also have an impact on biota, however the impacts are often species dependent and the research if often limited to specific species. The limits for the light technical parameters for environmental zones A0 to A2 take into account biota as large parts of these zones are generally uninhabited by humans.

Lue and the Local Environment

LAS considers that the AS/NZS 4282:2019 is an adequate measure to protect the area outside the Mine Site boundary and beyond from any unreasonable loss of amenity due to light obtrusion. The provisions of AS/NZS4282:2019 also minimise the generated sky glow. In addition to the requirements of AS/NZS4282:2019, LAS has also calculated the increase in vertical illuminance at Lue under low cloud conditions. The calculated increase in illuminance at Lue from under low cloud would be around 0.0016 lux.

The incremental increase in illuminance in Lue from the light reflected from the clouds would be around 0.3%. As the human eye can only discriminate a doubling or halving of illuminance the visual impact on Lue would be imperceptible. It would also be unmeasurable as the increase in overall illuminance is less than the uncertainty of a good quality light meter which typically has a minimum range of 0.1 lux and an accuracy of 2%.

Although the local sky glow would not be visible under clear sky there would be a faint glow on over the Mine Site during periods of low cloud.

Siding Spring Observatory and Significant Regional Observatories

The Mine Site is approximately 168km from the Siding Spring Observatory (SSO) and falls within the Dark Sky Region.

LAS has measured the reflectivity of the ore and waste rock that is proposed to be mined within the Mine Site and calculated the total lumens produced by the external lighting from the Mine Site and the total reflected and direct lumens emitted into the sky.

In addition, LAS has calculated the downward facing illuminance at altitude levels from 200 metres (m) to 96 000m and used that to estimate the luminance of particles in the atmosphere at those heights. The 96 000m altitude level equates to the 30 degree elevation from the SSO.

These figures have been provided to the SSO, together with the spectral distribution of the lamps to use in their assessment. SSO have responded to say that the impact of the Mine on the SSO would be negligible. Their response in included in **Annexure D**.

There are some other observatories that are included on the Australian Astronomical Societies List of Significant Observatories.

The Wiruna Observatory is approximately 10km southwest of Ilford and approximately 44km south of the Mine Site. This observatory is the latest addition to the Australian Astronomical Society's list of Significant Observatories. The 28,000m altitude level equates to the 30 degree elevation from the Wiruna Observatory.

The Wiruna Observatory is a similar distance from the Mine Site as it is from Mudgee and Bathurst both of which would have a much greater contribution to the sky glow than the Mine Site. The observatory would also be protected from the Mine Site by the intervening topography.

The next significant observatories close to the Mine Site than the SSO are near Bathurst which is approximately 85km south-southwest from the Mine Site.

It is understood that a range of sites in the central west are used for astronomical observations using fixed or portable telescopes, two of which are discussed below.

The Mudgee private observatory comprises four telescope domes and is located approximately 9km southwest of Mudgee. The township of Mudgee is between the observatory and the Mine Site and the observatory has a range of hills between the observatory and Mudgee. The Mudgee Observatory website says that observatory is "in a location of extremely dark skies away from the town lights and the lights of Ulan mines."

The observatory is not included in The Astronomical Society of Australia's list of designated observatories. The observatory is principally an educational facility.

The upward light from the Bowdens Silver Mine would be much less that the town of Mudgee and is three times as far from the observatory. The lights from the Bowdens Silver Mine Site would therefore not have a discernible impact on the operation of the Mudgee Observatory.

There is a location at Breakfast Creek where portable telescopes are used. The site is approximately 10km east of the Mine Site. The 30 degree elevation above the Mine Site would be approximately 6,000m altitude above the Mine Site. There would be a minimum increase in sky glow at this altitude.

CONCLUSIONS

Lue and the local environment

Based on the analysis LAS has carried out, LAS considers that the Project would have minimal impact on the residents of Lue and the surrounding district.

The proposed lighting within the Mine Site would fully comply with the limits imposed by AS/NZS4282:2019 for and A1 Environmental Environment, (A1- Dark Environment - Relatively uninhabited rural areas with the exception of the luminous intensity limit which it slightly exceeds, however, the distance from the lighting towers to the nearest residences means that the viewing angle of the lights would be less than 1 degree below the horizontal. At this angle, the cut-off of the distribution of the light reduces the intensity. In addition, when viewing the fittings from a distance greater than one kilometre, the relative size of the light is small which further reduces the impact.

The vertical illuminance increase in Lue would be too low to be perceived or measured.

There would be no perceivable increase in the sky glow under clear sky conditions in Lue and the area surrounding the site. When there is low cloud, there would be a slight glow over the Mine Site. While the effect may be visible, LAS has concluded that it would not constitute a reduction in amenity for residents.

The Siding Spring Observatory and other local Significant Observatories

The proposed lighting within the Mine Site would not emit direct light above the horizontal plane

LAS has calculated the total lumens, total upward lumens and the illuminance of sky particles at varying levels and submitted them to SSO for review. SSO's response states that it would have negligible impact on SSO. Their response is included in **Annexure D**.

The only significant observatories that are closer to the Mine Site than the SSO are the Wiruna Observatory near Ilford, which is 44km from the Mine Site, and two observatories near Bathurst, which are 85km from the Mine Site. LAS does not consider that the Mine Site would have a significant increase in the sky glow for these observatories.

Mudgee Observatory and the Breakfast Creek observation location are closer, but the Mine Site would have minimal impact on them compared with the surrounding towns and they are protected by the intervening topography.

The Breakfast Creek observation location is a casual space where portable telescopes are used. The mine lighting may have a minimal impact on observations made at low level over the Mine Site from this location.

Conclusion

Based on the analysis carried out by LAS the Project can operate on a 24hour basis without generating excessive light obtrusion to Lue, the area surrounding the Mine Site or the surrounding observatories.

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1. INTRODUCTION

Lighting, Art and Science Pty Limited (LAS) has been engaged to undertake an assessment of the potential impact of the lighting of the proposed Bowdens Silver Project on the operation of Siding Spring Observatory (SSO) and the local environment.

Any additional lighting has an impact on the environment and that impact is an inherent part of population expansion and industrialisation. The important criterion is one of reasonableness to determine whether the Project represents an unacceptable impact on the environment, the operation of the SSO or the amenity of the people in the surrounding area.

Our expertise does not extend to astronomy, so LAS has provided our base information and analysis to the SSO for further analysis.

Figure 1 shows the location of the Mine Site in relation to the SSO and the other local mines.

There is no detailed design for the lighting of the buildings and outdoor spaces at this stage so LAS has based the assessment on the information provided by Bowdens Silver as the quantity and disposition of the floodlight towers and information on typical processing facilities gained from an inspection of Ulan Coal Mine's above-ground facilities and an inspection of Moolarben Coal Mine from the public road network.

A new edition of AS/NZS 4282: *Control of the obtrusive effects of outdoor lighting* that was published in February 2019. This edition includes new environmental categories for 'Intrinsically Dark' and 'Dark' areas. The Intrinsically Dark areas are the areas adjacent to research observatories and declared Dark Sky areas.

The Dark areas are natural bushland and National Parks and relatively uninhabited rural areas. The limits for these areas are much lower than the limits in the previous standard and address the need to preserve dark spaces and limit the impact on biota.

The impact of light on biota varies from species to species and a lighting solution for one species may be detrimental to another. There is considerable research on some species whereas for the majority of species that is little research and much of the information has little research backing.

The obtrusive lighting limits from AS/NZS 4282:2019 that would apply to the Bowdens Silver Mine Site would be more stringent than those applied to the existing mines in the area.

It is acknowledged that different people would have a totally different opinion as to what is acceptable. One of the main purposes of AS/NZS 4282:2019 is to provide a benchmark for what people can reasonably be expected to accept.

This report addressed each of the lighting requirements nominated in the SEARs and supporting correspondence from Mid-Western Regional Council together with a series of comments provided by Lue and district residents. **Table 1** lists each of the requirements and the sections of this report where each requirement is addressed.

Figure 1 Location of the Mine Site with respect to SSO

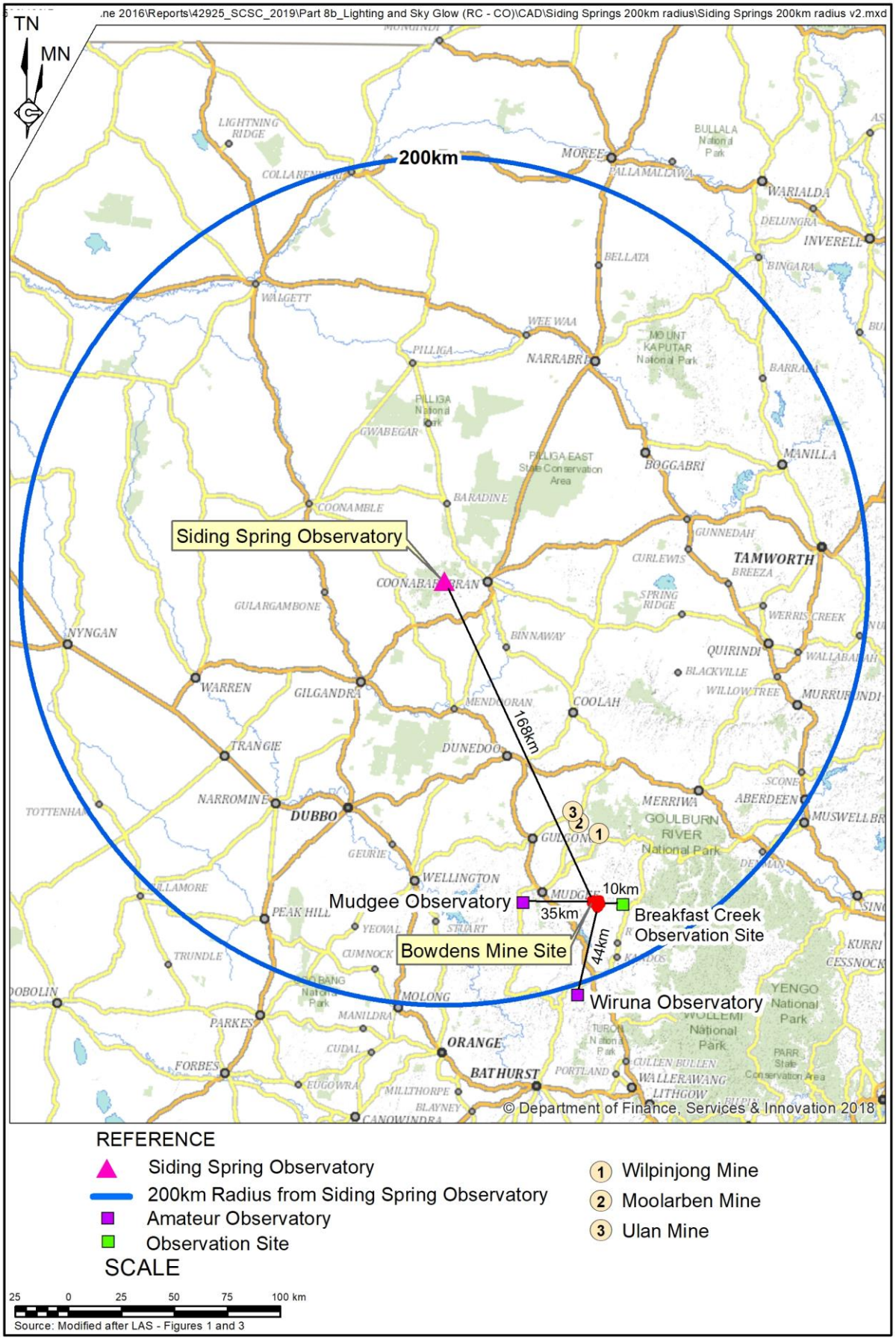


Table 1
Coverage of SEARs and Other Government Agency Requirements

Relevant Requirement(s)		Coverage in Report
Secretary's Environmental Assessment Requirements		
The EIS must include a detailed assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, paying particular attention to the creation of any new landforms and minimising the lighting impacts of the development.		See SCSC Part 8a
Relevant Requirements Nominated by Other Government Agencies		
Mid-Western Regional Council 14/02/13	Assess the potential impact of the lighting and light spillage on the neighbouring properties, Lue and the rural character of the area.	Section 5
	Council will also require light shielding modelling carried out as part of the assessment to demonstrate the likely impacts of light onto the neighbouring properties and Lue. Mechanisms on how to limit light shielding and the likely impacts it will have will also need to be demonstrated by the proponent.	Section 6.1
Relevant Requirements Nominated by Lue and District Community addressed		
The impacts to visual amenity of floodlighting and potential to reduce this during non-operational phases.		Sections 6 & 7
Visual impact of lighting on local community, livestock and wildlife.		Section 7*
The extent of night light.		Sections 5.3, 5.4, 5.5 & 7
We enjoy a clear dark sky – what would change when the mine is operational through a night glow?		Sections 5.4, 5.5, 7
Will the lighting on the mine affect astronomy activities at Breakfast Creek?		Sections 2.5 & 7.2
Negative impact will be 24 hours of light on community.		Section 7.1

* Only the impacts of lighting on human populations are considered in the Lighting and Sky Glow Assessment. The impacts of lighting on terrestrial ecology are considered in Section 7.4.9 of EnviroKey Pty Ltd.

2. PLANNING INSTRUMENTS, STANDARDS AND GUIDELINES AND OBSERVATORIES

The following planning instruments, standards, and guidelines are applicable to the Lighting and Sky Glow Assessment. Reference is also made to the SSO and other observatories that could potentially be impacted by the Project.

2.1 PLANNING INSTRUMENTS

Warrumbungle Local Environmental Plan 2013[1]

Part 5.14 of the Warrumbungle Local Environmental Plan (LEP) 2013 protects the dark environment of the SSO and gives the observatory Director rights for consultation and provides the legislative framework for the Dark Sky Planning Guidelines.

Dark Sky Planning Guideline [2]

The Dark Sky Planning Guideline was published by the Department of Planning and Environment (DPE) as a handbook to the Warrumbungle LEP. The guideline informs the assessment of significant development within 200km of the SSO and provides guidance and technical information on good lighting design. The Mine Site is located approximately 168km from the SSO, as displayed in **Figure 1**. **Figure 2** displays the intervening topography between the Mine Site and SSO.

2.2 AUSTRALIAN STANDARDS

AS/NZS 4282:2019 Control of the obtrusive effects or outdoor lighting [3]

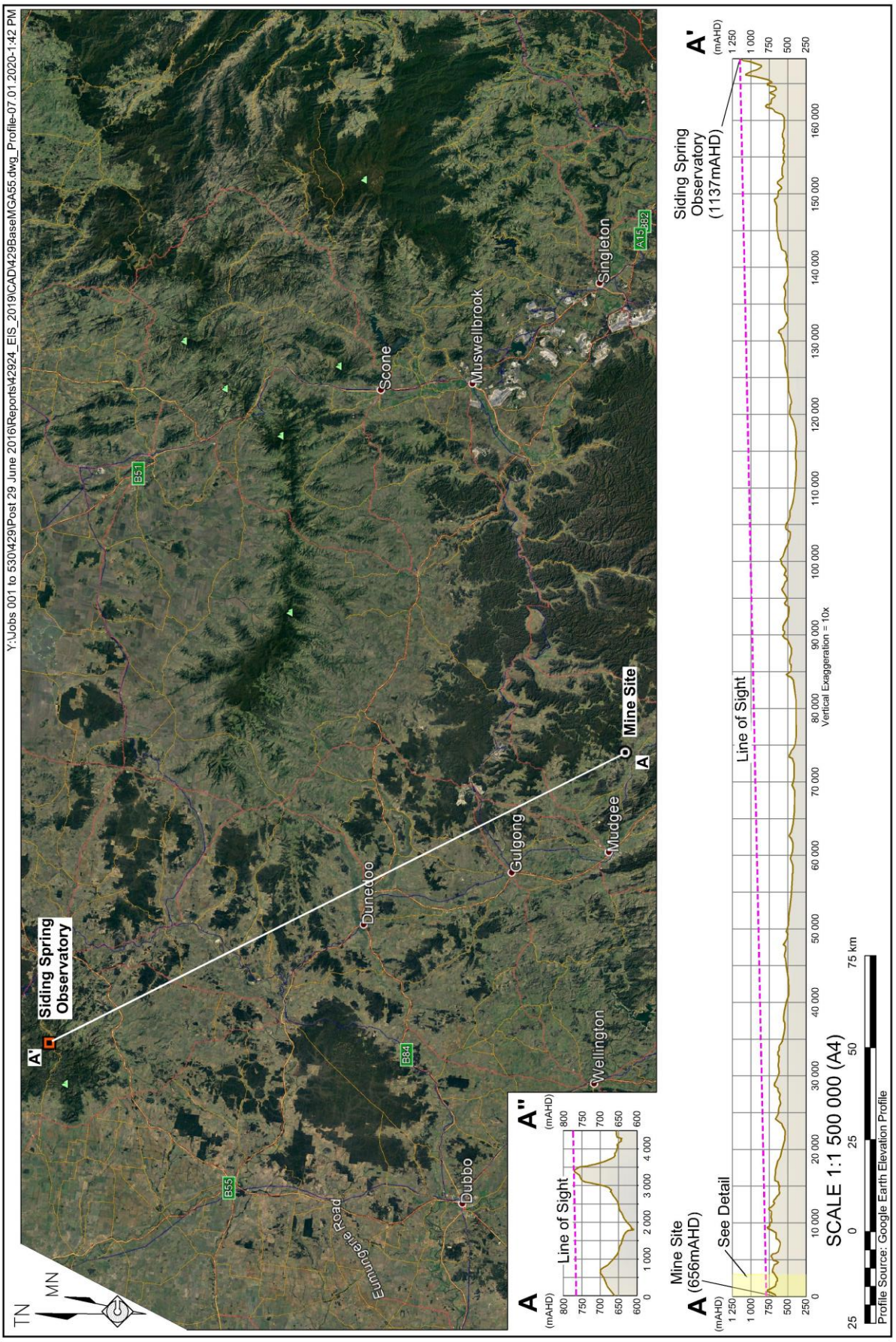
AS 4282 was originally written to control the impact of sports lighting on the amenity of surrounding residents but has a much wider scope of application. It was republished in 2019 and includes restrictions for intrinsically dark areas and light emissions to the sky. The standard is not referred to in legislation but is commonly relied upon when formulating conditions of consent by local government and a benchmark for what is reasonable.

AS/NZS 4282 standard specifies limits for the vertical illuminance surrounding the Mine Site, the upward light and the glare from the luminaires. Although primarily written to limit the impact of light on people, the standard also includes limits relating to astronomy and the environment and, as such, is applicable to the Project.

AS/NZS 1680.5:2007 *Outdoor Workplace Lighting* [4]

AS/NZS 1680.5:2007 was written as a guide for the functional requirements for good lighting of external workspaces. AS/NZS 1680.5:2007 recommends minimum illumination levels and other light technical parameters for a series of outdoor work-related activities. This study does not review the conformance with this standard, however, AS/NZS 1680.5:2007 provides a guide to the amount and disposition of working light.

Figure 2 Siding Spring Observatory Intervening Topography to the Mine Site



2.3 GUIDELINES

CIE Technical Report 126:1997 *Guidelines for minimising Sky Glow* [5]

This was one of the first reference documents on the minimisation of sky glow. The guidelines set out in CIE Technical Report 126:1997 provide a good explanation of the basic concepts of sky glow and available mitigation measures. It is still current and has been the basis many later documents.

IAU/CIE 001 *Guidelines for minimizing urban Sky Glow near astronomical observatories* [6]

This report overlaps with the CIE technical report but was produced in conjunction with the International Astronomical Union. It provides a more detailed account of the mechanisms and effects of Sky Glow.

International Dark-Sky Association – *International Dark Sky Park Program Guidelines* [7]

The International Dark Sky Park Program Guidelines deal with the requirements for a Dark Sky Park. Although the Warrumbungle National Park is a Dark Sky Park, the Mine Site is located outside that zone. Notwithstanding this, the International Dark Sky Park Program Guidelines contain some information of relevance to the Project.

2.4 DESIGNATED OBSERVATORIES

The Astronomical Society of Australia publishes a list of designated observatories [8]. These are referenced in AS/NZS 4248:2019 as observatories that have to be taken into account as part of an assessment. AS/NZS4282:2019 does not recommend additional parameters or limits that should be applied, but simply raises awareness of the observatories.

The nearest designated observatories on the list are listed on **Table 2**.

Table 2
Astronomical Observatories Considered in Lighting Assessment

Observatory	Distance from the Mine Site
Major Facilities	
Siding Spring Observatory	168km
University/Publicly funded facility	
UWS Penrith Observatory	340km
Significant Amateur Society/Private Observatories	
Koolang Observatory (Bucketty, near Newcastle NSW)	200km
Linden Observatory (Blue Mountains near Sydney)	170km
Mt Tarana Observatory - Mr Colin Bembrick (25km east-southeast of Bathurst NSW)	105km
Grove Creek Observatory – (40km south of Bathurst NSW)	140km
Bathurst Observatory (20km northeast of Bathurst NSW)	85km
Kirby Observatory - (UNE and Northern Tablelands Astronomical Society, Armidale NSW)	230km
Crago Observatory - (Astronomical Society of NSW, Bowen Mountain NSW)	180km
Wiruna Observatory, (Astronomical Society of NSW, Ilford)	44km

Wiruna Observatory

The Wiruna Observatory is a similar distance from the Mine Site as it is from Mudgee and Bathurst which would have a much greater contribution to the sky glow than the Mine Site. The 22,000m level is slightly lower than the 28,000m level that is 30 degree elevation over the Mine Site from the Wiruna Observatory. The observatory would also be protected from the Mine Site by the intervening topography. **Figure 3** (Section A-A[1]) displays the intervening topography between the Mine Site and the Wiruna Observatory.

The SSO has a control zone of 18km specified in the Warrumbungle LEP[1] and is the only designated Dark Sky Park in Australia. The LEP also gives the SSO a radius of 200km where potential substantive light sources such as mines must consult with the SSO. The township of Coonabarabran is just outside the 18km control zone. The Wiruna Observatory although in the process of being included on the Australian Astronomical Society's list of Significant Observatories, does not have the protection of an LEP or is within a designated Dark Sky Park. In the absence of regulations, LAS have based their assessment on a similar 18km zone. The Bowdens Silver Mine is approximately 44km from the Wiruna Observatory, 20km beyond the 18km zone.

2.5 OTHER OBSERVATORIES

Mudgee Observatory

The Mudgee private observatory comprises four telescope domes and is located approximately 9km southwest of Mudgee. The observatory has a range of hills between the observatory and Mudgee. **Figure 3** (Section B-B[1]) displays the intervening topography between the Mine Site and the Mudgee Observatory. The Mudgee Observatory website says that observatory is "in a location of extremely dark skies away from the town lights and the lights of Ulan mines."

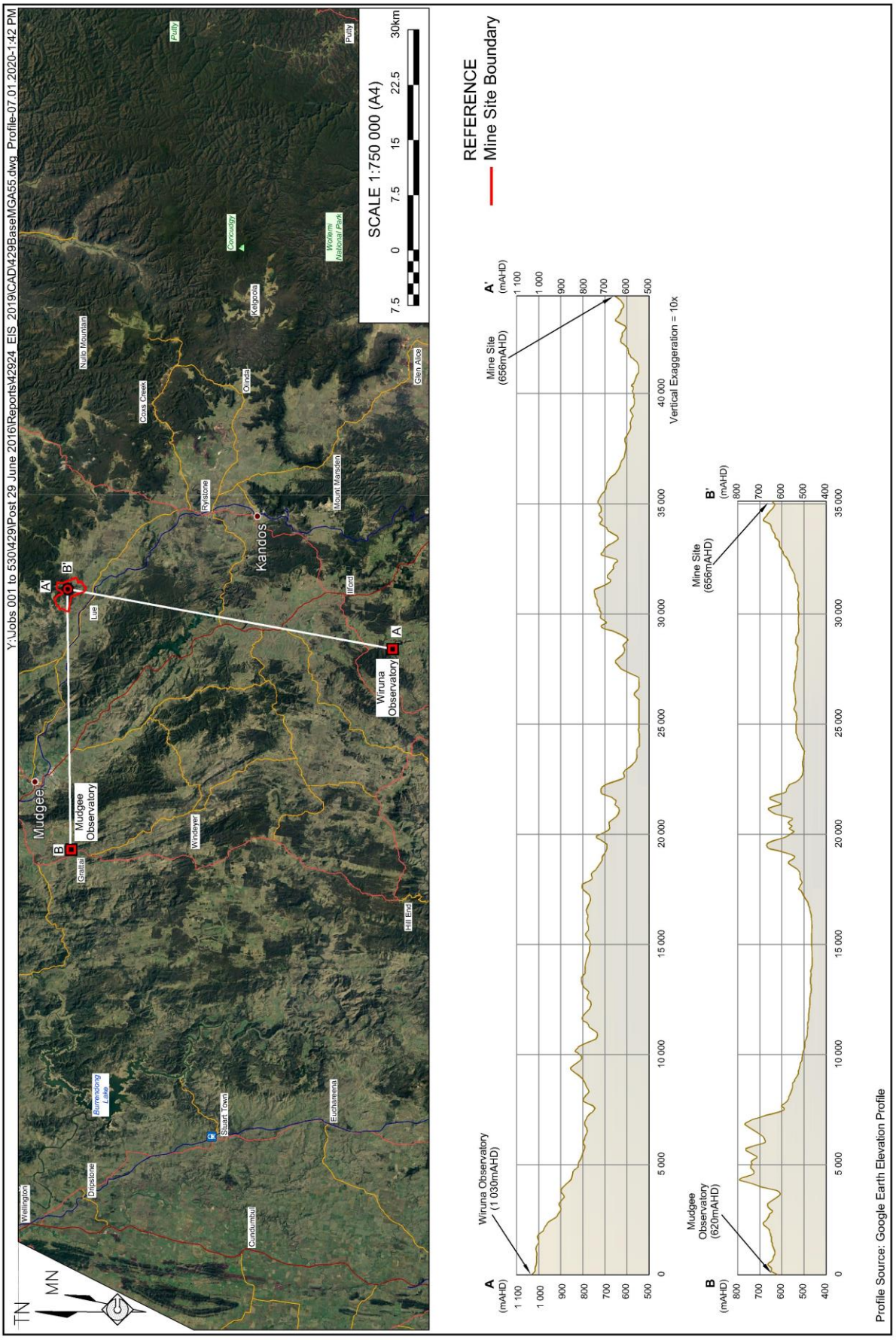
The observatory is not included in The Astronomical Society of Australia's list of designated observatories. The observatory is principally an educational facility.

The upward light from the Bowdens Silver Mine would be much less that the town of Mudgee and is three times as far from the observatory. The lights from the Bowdens Silver Mine Site would therefore not have a discernible impact on the operation of the Mudgee Observatory.

Breakfast Creek Observation Location

An astronomical observation location is located at Breakfast Creek where portable telescopes are used periodically by amateur astronomers. The site is approximately 10km east of the Mine Site. The 30 degree elevation above the Mine Site would be approximately 6,000m altitude above the Mine Site. There would be a minimum increase in sky glow at this altitude.

Figure 3 Sections from the Mine Site to the Amateur Observatories



3. LIGHTING TERMS AND CONCEPTS

3.1 INTRODUCTION

The following subsections provide a summary of lighting terms and concepts relevant to this report.

3.2 LIGHTING PARAMETERS

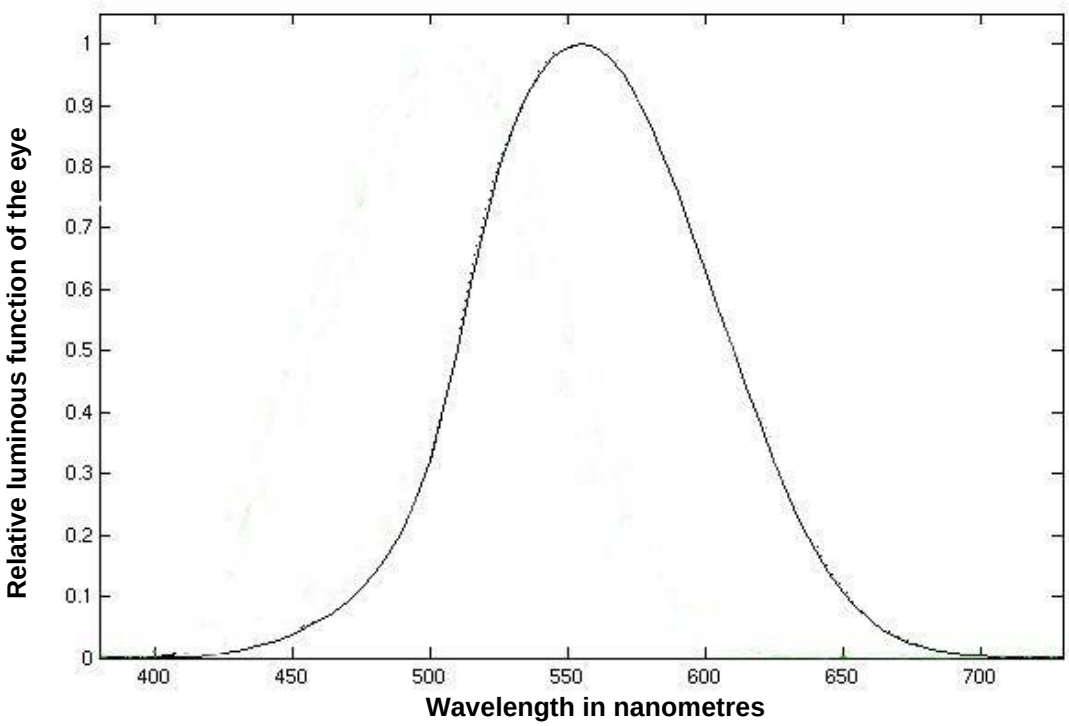
Visible Spectrum

The visible spectrum is the band of wavelengths of electromagnetic radiation that is visible to the human eye. This is normally accepted as the band between 380 (violet) and 740 (red) nanometres.

The eye does not have equal sensitivity across the visual spectrum. The spectral response of the eye is standardised as the V(ʎ) as shown in **Figure 4**.

The curve is the photopic response which occurs under normal lighting levels. The V(ʎ) curve shows the variation in the sensitivity of the eye at different wavelengths across the visual spectrum.

Figure 4 V(ʎ) Average Eye response



Light Source

A light source is any surface or object that emits light. The source may generate light, or it may reflect or transmit the light.

Radiant Flux

Radiant flux is the radiant energy emitted by a source, per unit time and is measured in **Watts** (W).

For the purpose of this study the radiant flux has been limited to the visible spectrum.

Radiant flux is not modified for the response of the human eye.

Luminous Flux

Luminous flux is the radiant flux emitted by a source, per unit time multiplied by V(ʎ) so that it reflects what is seen by the eye. Luminous flux is measured in **lumens**.

The luminous flux therefore understates the intensity of the Red and Blue end of the spectrum.

Luminous Intensity

Luminous intensity is the amount of luminous flux leaving the light source in a given direction.

It is measured in lumens/steradian or **candelas**.

Illuminance

Illuminance is the amount of light that falls on a surface or plane. The illuminance is independent of the characteristics of that surface or plane.

Illuminance is measured in Lumens/metre^2 or **lux**.

Luminance

The luminance is the amount of light leaving a surface. It may be reflected or transmitted.

The luminance is usually measured in **candelas/metre^2**.

Upward Light Ratio (ULR)

Upward Light Ratio is a light technical parameter used in AS/NZS 4282 and other Australian external lighting standards.

It is defined as “The proportion of the flux of a luminaire and/or installation that is emitted at or above the horizontal, excluding reflected light, when the luminaire(s) is/are mounted in its installed position(s). ULR=upward flux/total flux from the luminaire”.[3]

Some standards also refer to it as Upward Light Output Radio (ULOR). The terms are interchangeable.

Glare

Glare is any light that reduces the visual performance.

Correlated Colour Temperature (CCT)

This is an assessment of the colour appearance of the light source with reference to the appearance of a black body radiator at a specific temperature. While it is indicative of the tendency of the light to warm or cool, it does not provide definitive information with respect to the spectral distribution.

It assumes that the light source colour is close to white.

CCT is expressed in **Kelvin** units (K)

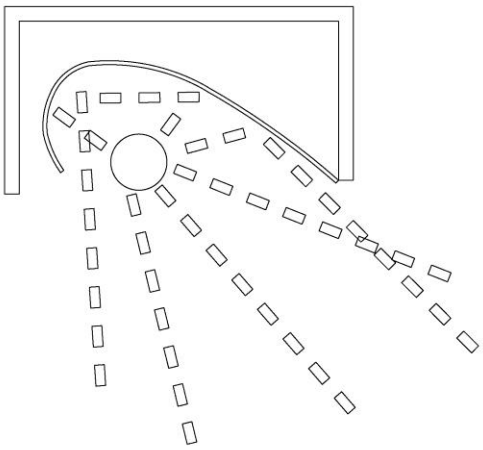
Luminaire

Luminaire is the technical term for a light fitting, and it includes the light source, the enclosure and optical control mechanism and the control equipment.

Forward Throw Luminaire

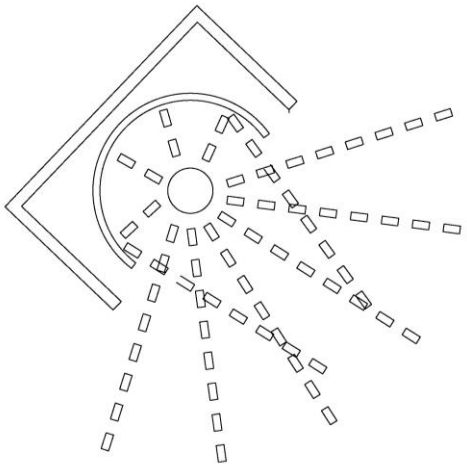
A forward throw luminaire is a fitting designed to be mounted with the front glass near horizontal and use reflectors or lenses to project the light forward without having to raise the tilt of the fitting. These fittings have minimal upward light contribution when used as designed (see **Figure 5**).

Figure 5 Forward Throw Floodlight



A luminaire with a symmetrical distribution throws the same amount of light above and below the axis of the luminaire. Because the peak intensity is perpendicular to the glass the luminaire has to be tilted up to light the area in front the of the luminaire. As a result, a significant part of the light is projected into the sky (see **Figure 6**).

Figure 6 Symmetrical Distribution Floodlight



A forward throw luminaire is also more efficient as less light is wasted.

3.3 REFLECTANCE

Reflectance is a property of a surface that determines the proportion of light that is reflected or absorbed by the surface. The sum of the reflectance and absorption is 100%.

Diffuse Reflection

A true diffuse (Lambertian) surface scatters the light uniformly in all directions independent of the angle of incidence of the light. The reflectance is related to the density of the colour of the surface. A perfect white surface has a reflectance of 100% whereas a perfect black surface has a reflectance of 0.

The relationship between illuminance and luminance for a perfect diffuser is:

Luminance of the surface = Illuminance x Reflectance/π

Specular Reflection

A specular surface is a mirror like surface where there is a real image of the light source visible in the surface. The angle of reflection is equal to the angle of incidence.

Luminance of the image = Luminance of the source x Reflectance.

This relationship only applies to area of the surface where the image can be seen.

Most real surfaces are a combination of specular and diffuse properties in varying degrees.

Colour and Reflection

The colour of an object is function of the spectral response of the material.

An object has a specific colour because the surface absorbs all wavelengths in the light other than those of the object. The spectral response of the material is constant however the colour appearance of the surface will change with the spectral distribution of the incident light. The spectral response of the material also affects the spectral composition of the reflected light. As a result, different coloured surfaces will affect the spectral content of the reflected light. For example; if light that is predominately blue is reflected off a red object the reflectance would be much lower than the same light on a blue surface, even though they may have the same reflectance under white light. The light that is reflected off the surface will also have a much lower blue content as it has been absorbed by the surface.

3.4 SKY GLOW

Sky glow is the brightening of the night sky that results from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter) in the direction of observation. It comprises two separate components. [5]

1. Natural sky-glow - that part of the sky-glow which is attributable to radiation from celestial sources and luminescent processes in the Earth's upper atmosphere. [5]
2. Man-made sky-glow - that part of the sky-glow which is attributable to man-made sources of radiation (e.g. artificial outdoor lighting), including radiation that is emitted directly upwards and radiation that is reflected from the surface of the Earth. [5]

Units

"Lighting engineering and astronomy both rely on photometry. The fundamentals are the same, but the conventions and the practical units differ. In lighting engineering, photometric units are usually related to photopic vision."

"In astronomy, the visual classification of cosmic objects is based on the 'magnitude' of the luminous objects like e.g. stars as they present themselves to the (mesopic) eye.

The magnitude scale is essentially a logarithmical one, where the magnitude difference of 5 relates to a flux ratio of 100." [5]

4. METHODOLOGY

4.1 INTRODUCTION

The methodology for the lighting and sky glow assessment has been divided into two separate components as the requirements are different, as are the calculation methods.

4.2 BACKGROUND INFORMATION

The following background information was provided by RWC on behalf of Bowdens Silver:

a) Site plan and scenarios for the night lighting

b) Section showing the elevation and obstructions between SSO and the site

c) Details of the proposed lighting

d) Samples of the ore and waste rock to be mined

This information is included as **Annexure A**.

Independently LAS has sourced:

a) Information of the nominated tower light

b) Lamp data including the spectral response

c) Data in alternate lighting equipment as alternatives to reduce the sky glow.

This information is included as **Annexure B**.

4.3 SITE INSPECTION

The Mine Site was inspected at day and night to:

- identify natural obstructions that would shield the lighting from the local environment; and
- assess the existing ambient lighting in the area and the existing sources of sky glow in the vicinity.

An existing Mine in the area was visited at night to assess the manner in which the lighting is used and to assess the current levels of sky glow from a mine.

4.4 LOCAL ENVIRONMENT LIGHTING CRITERIA

The local environment is principally controlled by the requirements of AS/NZS 4282 which recommends limits for specific light technical parameters based on the ambient lighting conditions.

LAS considers that the current edition of AS/NZS 4282 adequately addresses the requirements for a rural environment.

4.4.1 Environmental Zone

AS/NZS 4282 nominates 11 Environmental Zones – see **Table 3**.

Table 3
Environmental Zones Identified in AS/NZS 4282[3]

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	See AS/NZS1158.1.1
R1	Residences near local roads with significant setback	See AS/NZS 1158.3.1
R2	Residences near local roads	See AS/NZS 1158.3.1
R3	Residences near a roundabout or local area traffic management device	See AS/NZS 1158.3.1
RX	Residences near a pedestrian crossing	See AS/NZS 1158.4
Source: AZ/NZ 4282 – Table 3.1		

Based on **Table 3**, the area immediately surrounding SSO would be classified as an A0 zone, the area within Lue would be an A3 zone although it could be argued that Lue would be an A2 zone given the comparatively low number of residences and only five street lights. It is noted that four of the street lights in Lue are located on Lue Road with a single street light located opposite the Lue Hotel on Cox Street. The Mine Site would be an A2 zone, although it could be argued that the Mine Site is an A1 zone. For the purposes of this assessment LAS has assumed that the Mine Site is an A1 zone and Lue is an A2 zone, i.e. being the more stringent limit.

The A0 and A1 zones are assumed to be virtually unpopulated by humans. As a result, the levels that are set primarily relate to minimising the impact on other biota and to maintaining a dark environment. As the Mine Site surroundings have been assessed to be within an A1 zone, the required limits in AS/NZS4282:2019 adequately protect the night environment of the area surrounding the Mine Site.

4.4.2 Curfew

AS/NZS 4282 also specifies a curfew period between 11:00pm and 6:00am when a lower set of limits are specified.

An assessment for both the pre-curfew and curfew periods has been undertaken.

4.4.3 Light Technical Parameters

The light technical parameters that are controlled by AS/NZS 4282 are listed in **Tables 4** and **5**.

Table 4
Maximum Values of Light Technical Parameters in AS/NZS 4282 [3]

	Vertical illuminance levels (E_v) lx		Threshold increment (*TI*)		Sky glow
Zones	**Non-curfew**	**Curfew**	**%**	**Default adaptation level (L_{ad})**	**Upward light ratio**
A0	-	0	N/A	N/A	0
A1	2	0.1	N/A	N/A	0
A2	5	1	20%	0.2	0.01 (1%)
A3	10	2	20%	1	0.02 (2%)
A4	25	5	20%	5	0.03 (3%)
TV	-	N/A	20%	10	0.08 (8%)
V	N/A	4	-	-	-
R1	N/A	1	20%	0.1	Note 3
R2	N/A	2	20%	0.1	Note 3
R3	N/A	4	20%	0.1	Note 3
RX	N/A	4	20%	5	Note 4
Source: Modified after AS/NZ 4282 – Table 3.2					

Table 5
Maximum Luminous Intensities per Luminaire in AS/NZS 4282[3]

	Luminous intensity (*I*), cd		
Zone	**Non-curfew L1**	**Non-curfew L2**	**Curfew**
A0	See Note	See Note	0
A1	2 500	5 000	500
A2	7 500	12 500	1 000
A3	12 500	25 000	2 500
A4	25 000	50 000	2 500
TV	100 000	150 000	0
Source: AZ/NZ 4282 – Table 3.3			

4.4.3.1 Vertical Illuminance

This is the illuminance calculated in the vertical plane at the Mine Site boundary facing inward. Vertical illuminance is calculated on a grid of points from the ground to the highest light fitting or distribution of the light. For the purposes of this assessment, vertical illuminance has been calculated to 100m above ground level.

The limits for A1 are 2 lux for pre-curfew and 0.1 lux for the curfew period.

The limits for A2 would be 5 lux and 1 lux, respectively.

4.4.3.2 Threshold Increment

Threshold increment is a measure of the disability glare caused by the lighting to drivers of vehicles outside the site. The lights on the Mine Site would be too far from the local roads to be relevant for threshold increment.

4.4.3.3 Upward Light Ratio

Upward light ratio limits the light emitted into the sky to limit the impact on sky glow. For an A1 zone, the limit is zero. This does not mean that there is no light emitted into the sky because the calculations in AS/NZS 4282 do not include the light reflected off surfaces.

For an A2 zone the limit would be 0.01 (1%)

4.4.3.4 Luminous Intensity

This is a measure of the glare caused to people who have direct view of the lights within the Mine Site.

The limits for the A1 zone are 2 500cd in the pre-curfew period and 500cd in the curfew period. The limits for an A2 zone would be 7 500cd and 1 000cd, respectively.

Luminous intensity is of limited relevance to the Project as the Mine Site is surrounded by hills and there is only possible direct view of the lights from the south-eastern boundary, assuming that the lights are aimed in that direction. This boundary would be approximately 1km from the lights within the main open cut pit.

The assessment for the luminous intensity in AS/NZS4282:2019 for the obtrusive light is taken at an angle of 10 degrees below the horizontal. This is based on a playing field and assumes that it will limit the view beyond the other side of the field. For a 14m tower this light would hit the ground approximately 75m from the tower.

The nearest residence to the lighting towers (1Q[1]) would be approximately 400m and they would be facing away from the residence. The nearest tower that is facing in the direction of a residence is greater than 1000m away. At that distance the viewing angle below the horizontal plane would be 0.8 degrees.

[1] Residence 1Q is a Project-related residence.

Luminous intensity is often used as an indicator of glare as it is quicker to calculate. The initial AS/NZS 4282 was developed as a control principally for the impact of sports lighting, particularly backyard tennis courts.

There is good correlation between luminous intensity and glare for lights with a small source within a range of a few hundred metres. The correlation is not as accurate when the light source is large or the distance to the light source is large.

4.4.4 Conformance to AS/NZS 4282

Conformance calculations for AS/NZS 4282 were carried out using AGi32 Version 19.6, a high-end industry standard lighting software package which has a specific module for calculation of obtrusive light to AS/NZS 4282:2019.

4.5 SUPPLEMENTARY ASSESSMENT

In addition to the calculations required by the standard, additional calculations were carried out to provide more information on the impact on Lue and the area surrounding the Mine Site.

LAS has calculated the impact of the operation of the Project on the sky glow above Lue and the local environment under clear sky conditions.

When there is cloud cover over the Mine Site there would be reflected light off the clouds. This would be of little interest to SSO as they would not have visibility for observations. It would have some impact on the surrounding area as the clouds would reflect a glow from the lights within the Mine Site. LAS has modelled this in the software to calculate the increase in illuminance in Lue.

4.6 ASTRONOMICAL OBSERVATIONS

The requirements for the SSO are different to the local environment as they are concerned about light much higher in the atmosphere. The standard angle for assessment for the observatory is 30 degrees above the horizontal. This would mean that this would be 97km above the proposed mine. As a result, the calculations differ from the ones for the local area.

LAS has calculated the following:

4.6.1 Upward Light Ratio

The ULR has been calculated as part of the AS4282:2019 assessment for the local environment (see Section 5.3). This is also applicable for the SSO assessment.

4.6.2 Total Lumens Produced

This is a total lumen output of all the external fittings on the Mine Site. It does not take into account the shielding or the efficiency of the fittings. It is only useful as an overall benchmark of the size of the project.

4.6.3 Reflectance of the Ground

LAS has measured the reflectance of the ore and the waste rock to determine the amount of light that would be reflected into the sky.

As the colour of the material affects the spectral distribution of the reflected light, LAS has measured the CCT of the light source and that of the light leaving the sample. If the CCT is lower, it can represent a reduction in the blue content of the light.

4.6.4 Total Upward Lumens

LAS has been provided with several scenarios for the lighting of the project (see **Annexure A**).

LAS has modelled the scenarios based on the scenario that they consider would have the most impact. LAS can then calculate the total light that would be reflected into the sky.

4.6.5 Luminance of Sky Particles

As the Mine Site is relatively small in comparison with the distance to the calculation point the Mine Site can be assumed to be a point source. We can therefore calculate illuminance at different levels in the sky and use it to give an estimate of the luminance of a particle at that height.

5. ASSESSMENT

5.1 SITE INSPECTION

The Mine Site was inspected on 6th June 2019. The proposed main open cut pit is located on a central hill surrounded by a group of hills and ridges. On the north-eastern to the southwestern sides, the hills are higher and shield the surrounding area. On the south-eastern side, there is a valley through to the central hill, although the nearest residence is approximately 1km from the central hill.

A LAS consultant also visited the Ulan coal mine to observe the lighting of the administration, maintenance facilities and processing plant. The lighting of the facilities was generally high pressure sodium (HPS) lamps with forward throw distribution. LAS estimates that the ULR from this site would be close to 0.

A LAS consultant also viewed the Moolarben Coal Mine from the local road network. The mine was designed and built before the current limits on upward light were introduced. As a result, some of the conveyor belts appear to be lit with linear fluorescent weatherproof bulkhead fittings. These produce more upward light than the lights that would be used on the Bowdens Silver Mine Site. There would also not be similar lighting on conveyors within in the Bowdens Silver Mine Site. As a result, the Moolarben Coal Mine is not an indicator of the potential sky glow from the Bowdens Silver Mine.

5.2 REFLECTANCE MEASUREMENTS AND OBSERVATIONS

LAS was supplied with a set of samples of both ore and waste rock from the Mine Site.

The reflectance of the samples was measured against a sample of known reflectance and the CCT of the incident light and reflected light was measured.

Table 6 lists the CCT and reflectance that were measured.

Table 6
CCT and Reflectance Results

		Correlated Colour Temperature (CCT)	Reflectance
Sky		5 600	
Reference		5 140	
Ore 1	Cut	3 840	0.34
	Aged	3 803	0.29
Ore 2	Cut	3 886	0.46
	Aged	3 495	0.30
Waste Rock 1	Cut	-	-
	Aged	3 273	0.20
Waste Rock 2	Cut	3 752	0.31
	Aged	-	-

The rock samples have an average reflectance between 0.20 and 0.46. LAS used an average of 0.35 to calculate the reflected light into the atmosphere.

The CCT indicates that the reflected light from the rock has reduced from 5600K to an average of 3600K. This indicates a significant shift away from blue to red. This would indicate a reduction on the blue content of the reflected light.

The results of the reflectance measurements were used in the calculations undertaken for SSO to determine the upwards lumens and the downwards facing illuminance at different levels.

5.3 AS/NZS 4282 CALCULATIONS

A model of the Mine Site was built in AGi32. The program was used to calculate the light technical parameters for the obtrusive light conformance.

The lighting was calculated for the worst case of floodlight quantity and locations.

The lights were based on the Allight MS10 K-9: with 5, 2000W metal halide floodlights towers. Details for the lights are included in **Annexure B**.

LAS has asked Allight for the specification of the light, but they have not provided a response at the time of writing.

Based on the appearance of the fitting, LAS believes that the fitting is a Sylvania Brightline, 2000W.

There is always the possibility that a different fitting may be used as the model is upgraded over time.

LAS considers that the Brightline fitting is a good representation of the type of fitting that would be used.

LAS based the calculations on:

a) 7, towers each with 5 floodlights;

b) 13, Siteco 250W High Pressure Sodium fittings for the surrounding of the buildings; and

c) 16, Sylvania Raptor 600W LED forward throw area lights

The Raptor fitting has a series of front and side shields available which would reduce the luminous intensities at high level. LAS have calculated the lighting without any shields on the fittings. There is no detailed design for the external lighting on buildings or in carparks at this stage. Consequently, the lights have been located in typical positions to enable the assessment. The final design should enable better aiming of the lights to reduce the obtrusive impacts.

The angle of tilt (upcast) of the fittings was changed to determine at what point the lighting exceeded the luminous Intensity and the ULR.

Table 7 shows the light technical parameters required by the standard and the calculated results. The calculation summaries for each calculation are included in **Annexure C**.

Table 7
AS/NZS 4282: 2019 Conformance

	AS/NZS 4282: 2019		AGi32 Calculations	
	Pre-curfew	Curfew	Pre-curfew	Curfew
Parameter	**Recommended Limit**		**Maximum Calculation Point**	
Run 1 – Upcast Angle 0 deg				
Vertical Illuminance	2 lux	0.1 lux	0.013 lux	0.013 lux
Luminous Intensity	2500 cd	500 cd		
2000W Briteline MH			Conforms	1003 cd
250W HPS			Conforms	Conforms
600W LED			2879cd	2879cd
ULR	0.0%	0.0%	0.0%	0.0%
Conformance			Conforms	See Note 1
Run 2 – Upcast Angle 2.5 deg				
Vertical Illuminance	2 lux	0.1 lux	0.0139 lux	0.0139lux
Luminous Intensity	2500 cd	500 cd		
2000W Briteline MH			Conforms	883cd
250W HPS			Conforms	1064cd
600W LED			3813cd	3813cd
ULR	0.0%	0.0%	0.0%	0.0%
Conformance			Conforms	See Note 1
Run 3 – Upcast Angle 5 deg				
Vertical Illuminance	2 lux	0.1 lux	0.0160 lux	.0.0160 lux
Luminous Intensity	2500 cd	500 cd		
2000W Briteline MH			Conforms	932 cd
250W HPS			Conforms	2245 cd
600W LED			8611cd	8611cd
ULR	0.0%	0.0%	0.0%	0.0%
Conformance			See Note 1	See Note 1
Run 4 – Upcast Angle 7.5 deg				
Vertical Illuminance	2 lux	0.1 lux	0.0164 lux	0.0164 lux
Luminous Intensity	2500 cd	500 cd		
2000W Briteline MH			Conforms	1141cd
250W HPS			3808cd	3808cd
600W LED			32474cd	32474cd
ULR	0.0%	0.0%	0.0%	0.0%
Conformance			See Note 1	See Note 1

Table 7 (Cont'd)
AS/NZS 4282: 2019 Conformance

Parameter	AS/NZS 4282: 2019		AGi32 Calculations	
	Pre-curfew	Curfew	Pre-curfew	Curfew
	Recommended Limit		Maximum Calculation Point	
Run 5 – Upcast Angle 10 deg				
Vertical Illuminance	2 lux	0.1 lux	0.0260 lux	0.0260 lux
Luminous Intensity	2500 cd	500 cd		
2000W Briteline MH			Conforms	1400 cd
250W HPS			5599 cd	5599 cd
600W LED			59822 cd	59822 cd
ULR	0.0%	0.0%	0.1%	0.1%
Conformance			See Note 2	See Note 2

Note1: The luminous intensity exceeds the limit in the standard, however the luminous intensity limit is irrelevant if the fitting cannot be seen from outside the site either due to lights being aimed inwards or where there is an obstruction blocking direct view of the fitting.

Note 2: At 10degree upcast the ULR exceeds the limit in AS/NZS 4282 due to the upcast of the Raptor fittings. These were only tilted to this angle for comparison and would never be used at that angle as the light would no longer fall on the ground.

Based on the results in **Table 7**, even with the fittings at 10degree upcast (tilt), the vertical illumination levels at the Mine Site boundary are 25% of the limit in AS/NZS 4282:2019.

For simplicity all the lights were aimed to the same upcast angle for the purpose of assessment. When the detailed design is carried out the lights will be aimed to maximise the efficiency of the lighting and minimise the luminous intensity impact.

The calculations above have been made with no shields on the lights. For operational reasons the mine may require higher aiming angles for the 2000W Briteline fittings.

The lighting has also been calculated for upcast angles of the 2000W Briteline fittings of 45, 50 and 60 degrees. These results are in **Table 8**.

5.3.1 Summary of Calculations

5.3.1.1 Vertical Illuminance

Even with the lights at 10 degree upcast, and no shielding, the vertical illuminance, at the worst point is 25% of the curfew limit. This is the most significant parameter for the reduction in amenity for surrounding areas. It should also be noted that these calculation points are at the mine site boundary. The illuminance further reduces by a factor of 4 with a doubling of distance.

Table 8 shows that the 2000W Briteline fittings can be tilted to 60 degrees before the vertical illuminance limit at the mine site boundary is exceeded for the for the curfew period and it is still within the limit for the non-curfew period. If shields are installed, on the front and side of the fittings, to limit the upward light component and the luminous intensity near the horizontal plane, the vertical illuminance at the mine site boundary would reduce without significant reduction in the working illumination level within the Mine Site.

Table 8
AS/NZS 4282: 2019 Conformance with increased upcast

	AS/NZS 4282: 2019		AGi32 calculations	
	Pre-curfew	Curfew	Pre-curfew	Curfew
Parameter	Recommended Limit		Maximum calculation point	
Run 6 – Upcast General Angle 7.5 degree 2000W Angle 45 deg				
Vertical Illuminance	2 lux	0.1 lux	0.0730 lux	0.0730 lux
Luminous Intensity	2500 cd	500 cd		
2000W Briteline MH			3901	3901 cd
250W HPS			3808 cd	3808 cd
600W LED			32474 cd	32474 cd
ULR	0.0%	0.0%	0.7%	0.7%
Conformance				
Run 7 – Upcast General Angle 7.5 degree 2000W Angle 50 deg				
Vertical Illuminance	2 lux	0.1 lux	0.0870 lux	0.0870 lux
Luminous Intensity	2500 cd	500 cd		
2000W Briteline MH			7095	7095 cd
250W HPS			3808 cd	3808 cd
600W LED			32474 cd	32474 cd
ULR	0.0%	0.0%	0.9%	0.9%
Conformance				
Run 8 – Upcast General Angle 7.5 degree 2000W Angle 60 deg				
Vertical Illuminance	2 lux	0.1 lux	0.1764 lux	0.1764 lux
Luminous Intensity	2500 cd	500 cd		
2000W Briteline MH			15842cd	15842 cd
250W HPS			3808 cd	3808 cd
600W LED			32474 cd	32474 cd
ULR	0.0%	0.0%	1.4%	1.4%
Conformance				

5.3.1.2 Luminous Intensity

The upcast has been assessed for each of the selected floodlights.

Table 9 indicates the maximum upcast for each luminaire for A1 and A2 zones and the pre-curfew and curfew periods required to comply with AS/NZS 4282:2019 on the assumption that a person has a direct view of the fitting.

The assessment for the luminous intensity in AS/NZS4282:2019 for the obtrusive light is taken at an angle of 10 degrees below the horizontal. This is based on a playing field and assumes that it will limit the view at a location beyond the other side of the field. For a 14m tower this light would hit the ground approximately 75m from the tower.

Table 9
AS/NZS 4282: 2019 Luminous Intensity Conformance

	Maximum Upcast Angle			
	A1 Zone		A2 Zone	
Luminaire	**Pre-Curfew**	**Curfew**	**Pre-Curfew**	**Curfew**
2000W Briteline Metal Halide	10 degrees	Non-conformance	10 degrees	Non-conformance
250W HPS	5 degrees	0 degrees	10 degrees	0 degrees
600W LED	2.5 degrees	Non-conformance	10 degrees	Non-conformance

The nearest residence (1Q) to the lighting towers is approximately 400m away and the lights are facing into the site and away from the residence. The nearest tower that is facing in the direction of a residence is greater than 1000m from the residence. At that distance, the viewing angle below the horizontal plane would be 0.8 degrees.

Table 10 shows the luminous intensities at 1 degree below the horizontal at the various upcast angles.

Table 10
Luminous Intensity at 1 degree below Horizontal

	Upcast angle				
Luminaire	**0 degrees**	**2.5 degrees**	**5 degrees**	**7.5 degrees**	**10 degrees**
2000W Briteline Metal Halide	412cd	408cd	424cd	470cd	515cd
250W HPS	24cd	46cd	68cd	90cd	112cd
600W LED	308cd	1057cd	1800cd	2558cd	3308cd

Table 10 shows that at a distance of greater than 1 000m, all the fittings highlighted with tan comply for A1 curfew levels.

The fittings that are highlighted with orange do not comply with the A1 pre-curfew levels. These fittings are the 600W LED fittings that have been calculated without external shields. These fittings would be used in the carpark and outdoor storage areas that are at the other end of the Mine Site to the residences.

In addition, at distances of greater than 1000m the light source would be extremely small which would further reduce the visual impact.

If the 2000W Briteline fittings are tilted to the upcast levels in **Table 8**, then external shields should be added to the front and sides of the fittings that would prevent light being emitted in or above the horizontal plane. This would be necessary to limit the ULR.

If the shield is extended to exclude light from 5 degrees below the horizontal plane, the luminous intensity at 1km would be zero and there would be a significant reduction in the vertical illuminance on the Mine Site boundary.

5.3.1.3 Upward Light Ratio

The ULR requirements for pre-curfew and curfew are the same.

The ULR conforms for the A1 requirement for all angles of upcast up to 7.5 degrees.

At 10 degrees the 600W LED fitting, without shields, brings it above the 0% ULR, however in practice, these would never be aimed at a high upcast.

Even with the 600W LED fitting with a 10 degree upcast, the installation meets the ULR for the A2 zone.

Above 10 degrees upcast the lights would require the addition of a shield on the front and side to keep ULR to zero.

5.4 SUPPLEMENTARY CALCULATIONS

5.4.1 Illuminance at Lue and Other Residences

Although it is well beyond the boundary for AS/NZS 4282, LAS calculated the direct vertical illuminance at Lue. There are several residences on properties 1P[2], 1Q[3] and 4 (G.V. Robinson) on the Land Ownership Figure in **Annexure A**, that are not protected from the view of the Mine Site by the intervening topography. The vertical illuminance at the boundary is less than 20% of the limit and the illuminance at the residence would be less as the illuminance reduces proportional to the square of the distance.

AGi32 cannot give a result less than 0.0001 lux. The vertical illuminance in a plane 100m high at Lue gave illuminance values of 0.0000. It should be noted that a high-quality illuminance meter can only measure to 0.01 lux and to see an illuminance of 0.0001 lux you would need to be dark adapted for an extended period.

5.4.2 Luminance of Dust and Cloud over the Site and the Illuminance at Lue with Reflected Light from the Clouds

The presence of airborne dust particles can contribute to sky flow. Ramboll (2020)[9] predicts mining operations would generate no more than 75ug/m^3 of PM_{10} (dust particulates with a diameter of less than 10µm) per hour at ground level after dusk. These concentrations would be significantly lower at altitude with concentrations at 100m and 200m predicted to be approximately 2% and 1% of ground level concentrations, respectively (Ramboll, pers comm). As such, airborne dust particles generated by the Project are expected to have a negligible impact on sky glow.

The time when the light from the Mine Site is most likely to be noticed is when there is cloud over the Mine Site. There would be a glow reflected from the cloud at varying heights. LAS has calculated the luminance of the cloud and the resulting illuminance in Lue from the light reflected from the cloud.

[2] Residence 1P is a Project-related residence.
[3] Residence 1Q is a Project-related residence.

Table 11 lists the calculated illuminance on the cloud, the estimated luminance of the cloud and the resulting illuminance at Lue.

Table 11
Cloud Reflection

Height Above Ground Level	Illuminance on the Underside of the Cloud	Luminance of the Cloud	Vertical Illuminance at Lue
200m	8.49 lux	0.27cd	0.0004 lux
500m	1.59 lux	0.051cd	0.0009 lux
1,000m	0.622 lux	0.020cd	0.0016 lux
5,000m	0.035 lux	0.0011cd	
10,000m	0.0		

This level of cloud would not be visible in Lue due to the substantial hills between the Mine Site and Lue.

There would be a slight increase in the illuminance at Lue as the height of the cloud increases. This is due to the decreased shading of the hills between the Mine Site and Lue.

The light from a full moon is around 0.5 lux. The average illumination level from the few street lights in Lue approximately 0.5 lux. The increase in illuminance level at Lue from reflection from cloud would be around 0.5%.

The incremental increase in illuminance in Lue from the light reflected from the clouds would be around 0.3%. As the human eye can only discriminate a doubling or halving of illuminance the visual impact on the Lue would be imperceptible. It would also be unmeasurable as the increase in overall illuminance is less than the uncertainty of a good quality light meter which typically has a minimum range of 0.1 lux and an accuracy of 2% .

In the rural areas surrounding the Mine Site, the incremental difference in illuminance would be greater as the base illuminance would be less, but the levels would still be too low to measure and would only be perceptible with a fully dark-adapted eye.

The luminance of the sky would only be noticeable under overcast conditions and then, it would only be a faint glow. The resulting impact on residents within Lue would be negligible.

The lighting would therefore have negligible impact on the amenity of the residents in Lue and the rural area immediately surrounding the Mine Site.

The lighting levels recommended in AS/NZS4282:2019 are principally related to the impact on native biota and the night sky. The illumination levels calculated are well below the limits recommended in the AS/NZS4282:2019.

5.5 CALCULATIONS FOR SIDING SPRING AND OTHER LOCAL OBSERVATORIES

5.5.1 General

The primary observatories in the vicinity of the Mine that are being assessed are the Siding Spring and Wiruna Observatories.

The information below has been prepared for the assessment of the SSO but are also applicable to the Wiruna Observatory.

The angle nominated by SSO for the assessment of the sky glow is 30 degrees of elevation.

As the Mine Site is 168km from the observatory, the reference point would correspond to a height of 97km above the site.

In applying the 30 degree angle to the Wiruna Observatory the reference point would be 22km above the Mine Site.

5.5.2 Lumens Generated

The total lumens generated is the total of the lumens produced by the external luminaires. The total does not take account of the direction of aim of the luminaires as there is an upward light Ratio of 0%.

LAS has also calculated the lumens reflected from the ground as this is a better indication of the impact on sky glow. As shown earlier, the colour of the ore and waste rock is relatively light and therefore the material has a relatively high reflectivity.

The total luminaire lumens for the external lighting would be 7,262,615. None of this would be emitted directly into the sky.

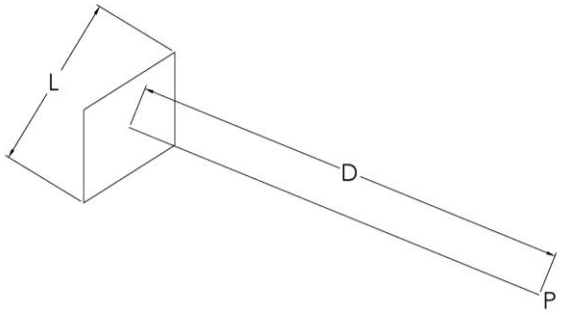
The total reflected upward lumens would be 2,541,915.

5.5.3 Illuminance at Varying Heights

LAS has calculated the illuminance at varying heights in the sky, facing downward.

If the distance to the light source is approximately 5 times or greater than the length of the major axis of the light source then the light source can be considered to be a point source (see **Figure 7**). This is a standard relationship used for photometric measurement.

Figure 7 Point Source



P = Calculation or measurement point
D = Distance from the light source to the
L = Maximum dimension of the face of the light source
If D ≥ 5 x L then the light source can be considered to be a point source.

If the light source is considered a point source, then the illuminance at the calculation point is the luminous intensity of the light source divided by the square of the distance from the light source.

In this case, the entire Mine Site is the light source as LAS is calculating the impact of light reflected from the ground.

At heights of 5000m and less, LAS has used AGi32 to calculate the light as the program is better at calculating the impact of an area light source.

Above 5000m, the illumination levels are too low for AGi32 to handle and the area of the ground that is illuminated, which effectively becomes the light source, is small compared with the distance to the calculation point and can be treated as a point source.

5.5.4 Luminance at Varying Heights

LAS has calculated the luminance of a particle at the various heights. The assumption is that the particles would have a reflectance of 30% which is relatively high. It should be noted that this is the luminance of a single particle and does not represent the luminance of the background sky glow. That would depend on the concentration of the particles in the atmosphere at that height.

Table 12 lists the illuminance and particle luminance at each height.

Table 12
Calculated Sky Glow

Height (metres)	Downward facing Illuminance (lux)	Estimated Particle Luminance (candelas /metre ^{2})
5 000	0.026	.0029
10 000	0.0081	.00067
22 000 (30 degrees-WO)	1.67×10^{-3}	1.4×10^{-4}
50 000	3.2×10^{-4}	2.7×10^{-5}
96 000 (30 degrees-SSO)	8.6×10^{-5}	7.1×10^{-6}

To give an indication of the magnitude of the luminance of the objects from the CIE Guidelines for Minimizing Sky Glow gives a figure of 3.52×10^{-4} cd/m^2 as the natural background illumination of the sky.

5.5.5 Light Colour

The 2000W floodlights on the mine lighting towers use metal halide lamps. There are several manufacturers of metal halide lamps that suit this fitting. The Philips lamp has a CCT of 4200K whereas the Osram lamp is 4550K. The Sylvania lamps have a colour temperature of 4000K. The lamps are interchangeable and in practice the difference in colour is probably close to the manufacturing tolerance.

Irrespective of the specific lamp used, there would be a shift in the CCT of the light reflected off the ground due to the absorption of the blue light by the ore and waste rock.

There is no 2000W high pressure sodium and at present there are no LED fittings with the equivalent output of a 2000W Metal Halide. It is possible to build up LED fittings in modules to achieve that output but the size would be considerably larger than the Metal Halide fitting and not only would it be difficult to get them onto the head frame of the tower but there would be a significant increase in windage due to the area of the fittings.

With current LED technology it would be difficult to get the same optical control given by the 2000W Metal Halide.

LAS has included 250W HPS forward throw floodlights for the areas surrounding the buildings and 600W LED fittings to light the carparks and open areas. The CCT of the HPS lamps is 2000K.

Although LAS has included HPS lamps it is a dying technology as equal efficacy can be achieved with LEDs with significantly longer light source life. In time, HPS lamps are going to become rarer and more expensive.

The LED floodlights LAS used have a CCT of 5700K. It is possible to get LED floodlights with a lower CCT however as the majority of this size of light are made for sport broadcasting and are therefore are the standard product.

In all cases, there would be a shift in the CCT of the light reflected off the ground due to the blue absorption of the ore and waste rock although the shift with the HPS would be less as there is less blue in the spectral distribution.

5.5.6 Calculated Night Sky Brightness

The calculations and data assembled in this section have been provided to the SSO who have calculated that the night sky brightness above the SSO as a result of the Bowdens Silver Project would be negligible. (see correspondence from the SSO in **Annexure D**).

6. RECOMMENDED MITIGATION MEASURES

The calculations indicate that the impact of the lighting of the Mine Site, on the local environment and SSO would be significantly less than the limits contained in AS/NZS 4282:2019 and the SSO Dark Sky Planning Guidelines[2].

Provided that the detailed design and implementation of the lighting is consistent with the general design requirements listed below, and the information on which the assessment is based, there would be no need for additional mitigation measures.

6.1 GENERAL DESIGN REQUIREMENTS

a) All lighting within the Mine Site should be designed for meet zone A1 in AS/NZS 4282:2019

b) All light sources should have CCT of 3000K or less, except for the 2000W Floodlights that may have a CCT of less than 4500K.

c) All floodlights should be forward throw luminaries with a maximum upcast of 10 degrees. Wherever possible the upcast should be zero.

d) Floodlights should be fitted with forward upward light shields to limit the upward light output and luminous intensity when viewed from off the Mine Site.

e) Where the 2000W Briteline fittings are aimed with an upcast higher than 10 degrees they shall be fitted with external shields on the front and side that shield all light from five degrees below the horizontal and above.

f) An alternative fitting to the Briteline could be used on the lighting towers. The Philips Optivision or Siteco Maxi A3 have a strong, forward throw, asymmetrical distribution which means that they light the same area with their glass horizontal to the ground, as a Briteline fitting with an upcast of 50 degrees. With the Philips or Siteco fitting minimal external shielding would be required. Details are included in **Annexure B6**.

g) Where practical, floodlights should be aimed towards the centre of the Mine Site.

h) Lights with diffusing covers or with visible bare lamps that emit light above the horizontal plane should not be used on the outside of buildings or structures

i) The floodlighting towers should not be used when the relevant activities are not operating.

7. CONCLUSION

7.1 LOCAL ENVIRONMENT AND LUE

The provisions of AS/NZS 4282: 2019 are adequate to protect the amenity of the residents within Lue and the local area around the Mine Site.

7.1.1 Illuminance

The calculations indicate that, in both the pre-curfew and curfew periods, the Mine Site would cause negligible increase in illuminance at the site boundary and none in Lue under clear sky conditions.

Under overcast conditions, there would be a slight sky glow reflected from the clouds, but LAS does not consider that this would result in a loss of amenity or significantly impact the biota.

7.1.2 Luminous Intensity

The luminaires generated from lighting on the Mine Site would slightly exceed the luminous intensity limits for the A1 and A2 zones. However, the distance from the luminaires would be great enough to prevent this from having an impact on the surrounding area.

The addition of shields on the lights would reduce the luminous intensity at the property boundary to zero.

7.1.3 Upward Light Ratio

The ULR would be less than the standard for all angles of upcast less than 10 degrees and some of the fittings can be tilted to 10 degrees without adversely affecting the ULR. LAS believes that when the lighting is designed for the Project, the ULR would be controlled by the efficient design with forward throw luminaires.

Where higher aiming angles are required shields shall be fitting to the lights to eliminate direct upward light.

7.1.4 Summary

LAS considers that the proposed lighting of the Mine Site would have minimal impact on the surrounding environment and Lue both in the pre-curfew and curfew periods.

7.2 IMPACTS ON OBSERVATORIES

LAS has calculated the Total Lumens into the sky and the illuminance and luminance at various elevations.

SSO has confirmed that the Project would have negligible impact on their operation. Correspondence from the SSO presenting the results of the calculations relating to the Project is reproduced in **Annexure D**.

LAS considers that the Mine Site lighting would have negligible impacts on the observatories at Wiruna and Mudgee and minimal impact on observations from the Breakfast Creek for low elevation observations directly over the Mine Site.

8. REFERENCES

1 *Warrumbungle Local Environmental Plan 2013*

2 *Dark Sky Planning Guideline, Protecting the observing conditions at Siding Spring* — NSW Department of Planning and Environment, June 2016

3 *AS/NZS 4282:2019 Control of the obtrusive effects or outdoor lighting* Standards Australia Feb 2019

4 *AS/NZS 1680.5:2007 Outdoor Workplace Lighting* Standards Australia 2007

5 CIE 126, *Guidelines for minimizing sky glow*

6 CIE 001-1980, *Guidelines for Minimizing Urban Sky Glow Near Astronomical Observatories* (Joint Publication IAU/CIE)

7 *International Dark Sky Park Program* Guidelines International Dark-Sky Association

8 *Current List of Designated Observatories* The Astronomical Society of Australia. http://asa.astronomy.org.au/observatories.php

9 Ramboll Australia Pty Ltd (2020) – Air Quality Assessment, Part 2 of the Specialist Consultant Studies Compendium. Prepared on behalf of Bowdens Silver Pty Limited

Annexures

(Total No. of pages including blank pages = 82)

Annexure A*	Background Information provided by RWC (16 pages)
Annexure B*	Proposed Lighting Equipment (18 pages)
Annexure C*	Lighting Calculations (44 pages)
Annexure D	Correspondence from SSO (2 pages)

* This Annexure is only available on the digital version of this document

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Annexure A

Background Information provided by RWC

(Total No. of pages including blank pages = 14)

A1 Mine Site Layout

A2 Schedule of Land Ownership – Lue Surrounds

A3 Land Ownership Plan

A4 Waste Rock Samples

A5 Ore Samples

A6 Night Lighting Scenarios

Note: This Annexure is only available on the digital version of this document

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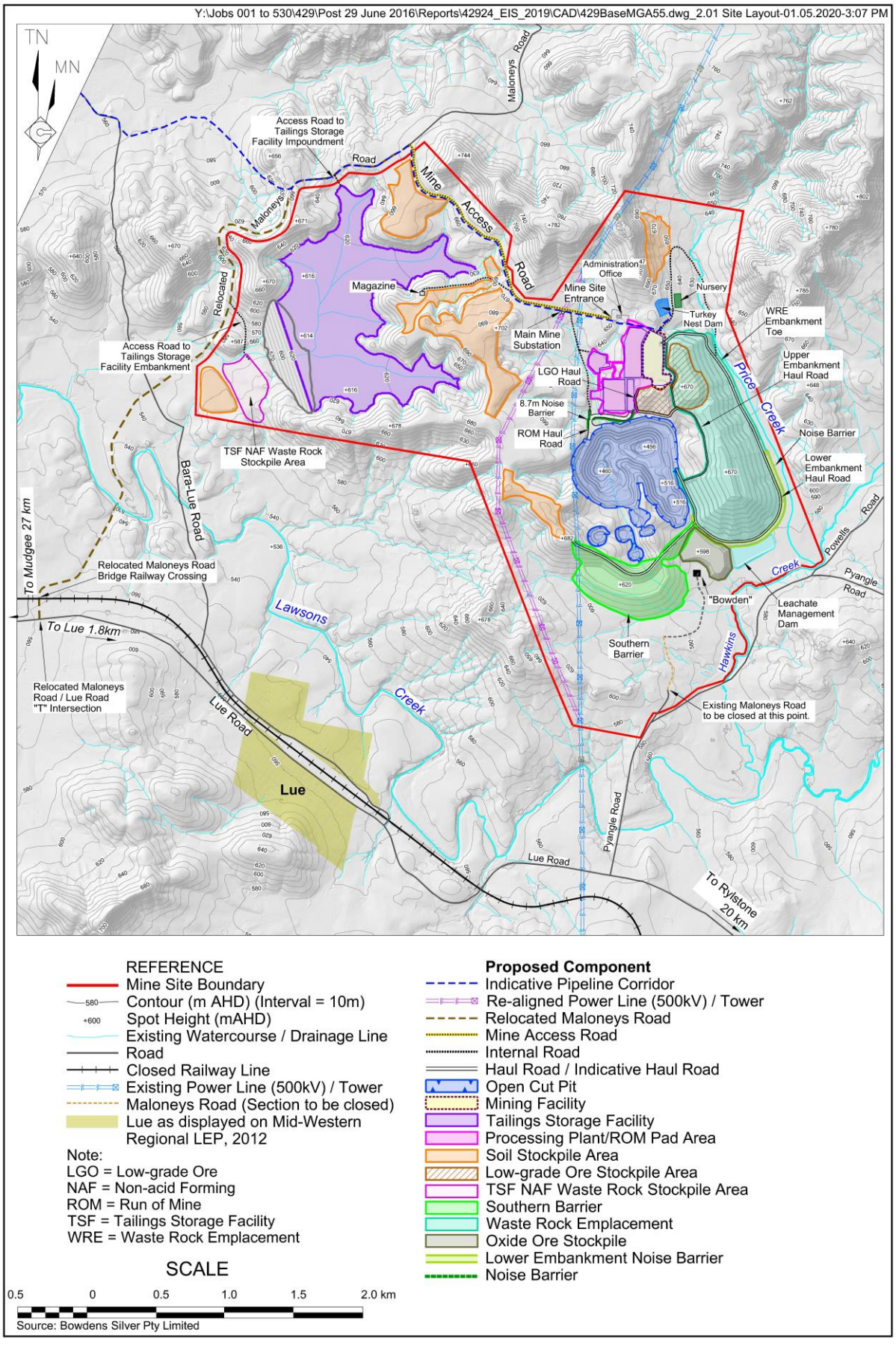
A1 – Mine Site Layout

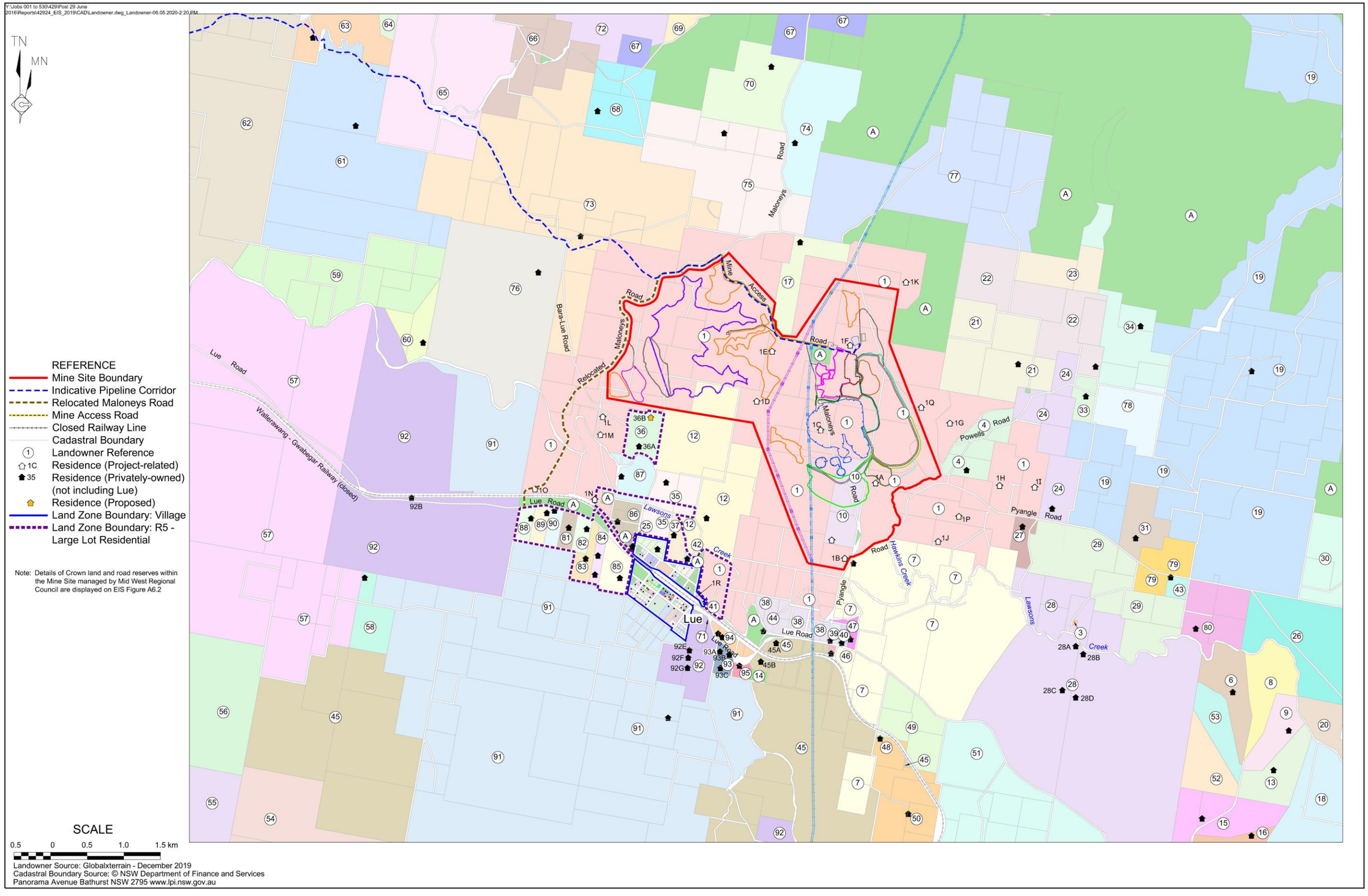


A2 - Schedule of Land Ownership – Lue Surrounds (3 December 2019)

Ref[1]	Owner	Ref[1]	Owner
A	Crown Land	50	ACN 059 643 533 Pty Limited
1	Bowdens Silver Pty Limited[2]	51	J.W. & J.M. Kerr
3	Monival Pastoral Company Pty Limited	52	A.J. & A. Hood
4	G.V. Robinson	53	C.M. Wood
6	N.G. & J. Patterson	54	Mudgee Local Aboriginal Land Council
7	Lochiely Pty. Limited	55	D.A. & S.M. Nelson
8	Sam Lynch Electrical Pty Limited	56	J.M. & S.G. Ward
9	A.M. & E.R. Backhouse	57	Havilah South Pty Limited
10[5]	B. Winter	58	A.M Curro
12	J.C. Lydiard	59	S.J. Inglis
13	J.M. O'Neill	60	R.J. & D.M. Barnes
14	A.E. Erskine	61	J.R. & A.M. McNiven
15	P.J.S. & J.A. Bentivoglio	62	N.D. White
16	L.A. & G.P.J. Van Oosterum	63	T.W. & D.L. Kavanagh
17	C.A. Dryden	64	S.L. & S.K. Drent
18	M.J. Brown	65	C.B. & S.L. Cunningham
19	R.G & G.R Mills	66	R.I. Smith & D. De Groot
20	W.A. Brown	67	D.W. & S.A. Chandler
21	K.R. & J. Hornery	68	I.C. & H.A. Hinton
22	M. F. Boller	69	A. & V. Muller
23	D.J.C. Nevell	70	Tugulawa Homestead Pty Ltd
24	G.R. Price	71	State Rail
25[3]	A.A. Skinner	72	P.R. Orr
26	T.J. Stanford	73	WJ Murdoch & Co Pty Limited
27	M.C. & L.R. Friend	74	M.N. & E. Brown
28	Attunga 2850 Pty Ltd	75	P.F. Van Oosterum
29	S.G. & K.D. Price	76	Merryvale Farm Pty Limited
30	R.J. Bleach & L. Smink	77	J. Walker
31	P.J. Carkagis	78	S.J. Price
33	D.S. Anderson & C.L. Downie	79	Stanford (Botobolar) Pty Limited
34	F.F. Beckingham	80	B.R. & D. Clear
35[4]	M.R. Clydesdale	81	L.J. Jones
36	L.M. Patsky	82[3]	D.G. & R.M. Short
37[3]	L.A. Coombe	83[3]	K.R. Rumney
38	T.F. McDonald	84[3]	P. Francis & N.J. Krull
39	C. Gordon & L. Tubnor	85[3]	S.L. & K.A. Turner
40	M. Mitchell	86[3]	A.J. Eno
41	Lue Hospitality Pty Ltd	87[4]	P.B.C. & M.M. Cameron
42	R.A. Bray	88[3]	A. & C.M Jameson
43	S. Burnett	89[3]	G. Andrew & S.J Paterson
44	L.J. & E.R. Statham	90[3]	D.R. Stearman
45	T.D.P. & S.E. Combes	91	Lue Station Pty Ltd
46	T.A & A.O Brown	92	T.D. Combes
47	G.T. Walsh	93	R.E. & C.A. Hawkins
48	ACN 059 643 533 Pty Limited	94	D.M. & C.L. Knott
49	R. C. Scifleet	95	L.D. Adams & D.L. Grisedale

Notes:
1. Some reference numbers have been removed as some properties have been acquired by Bowdens Silver Pty Ltd or existing landowners in the Lue District since the reference numbers were first assigned.
2. Or under purchase option.
3. This property is located in the R5 Large Lot Residential Zone (LEP 2012) surrounding Lue.
4. This property is partly located in the R5 Large Lot Residential Zone (LEP 2012) surrounding Lue.
5. Bowdens Silver Pty Ltd has an agreement with this landowner to undertake the Project on their property.

A3 – Land Ownership and Residences – Lue Surrounds



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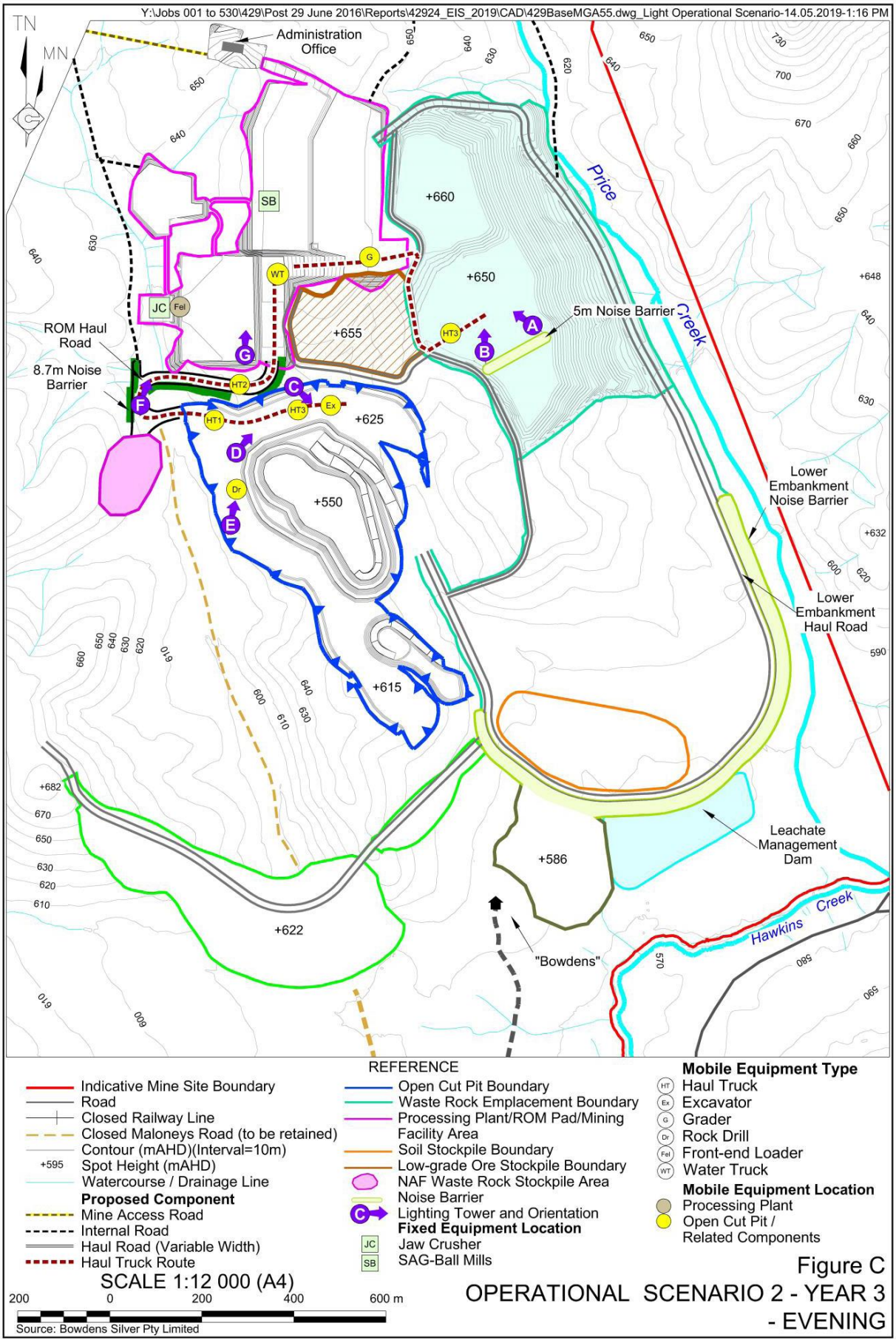
A4 – Waste Rock Samples

A5 – Ore Samples

A6 - Night Lighting Scenarios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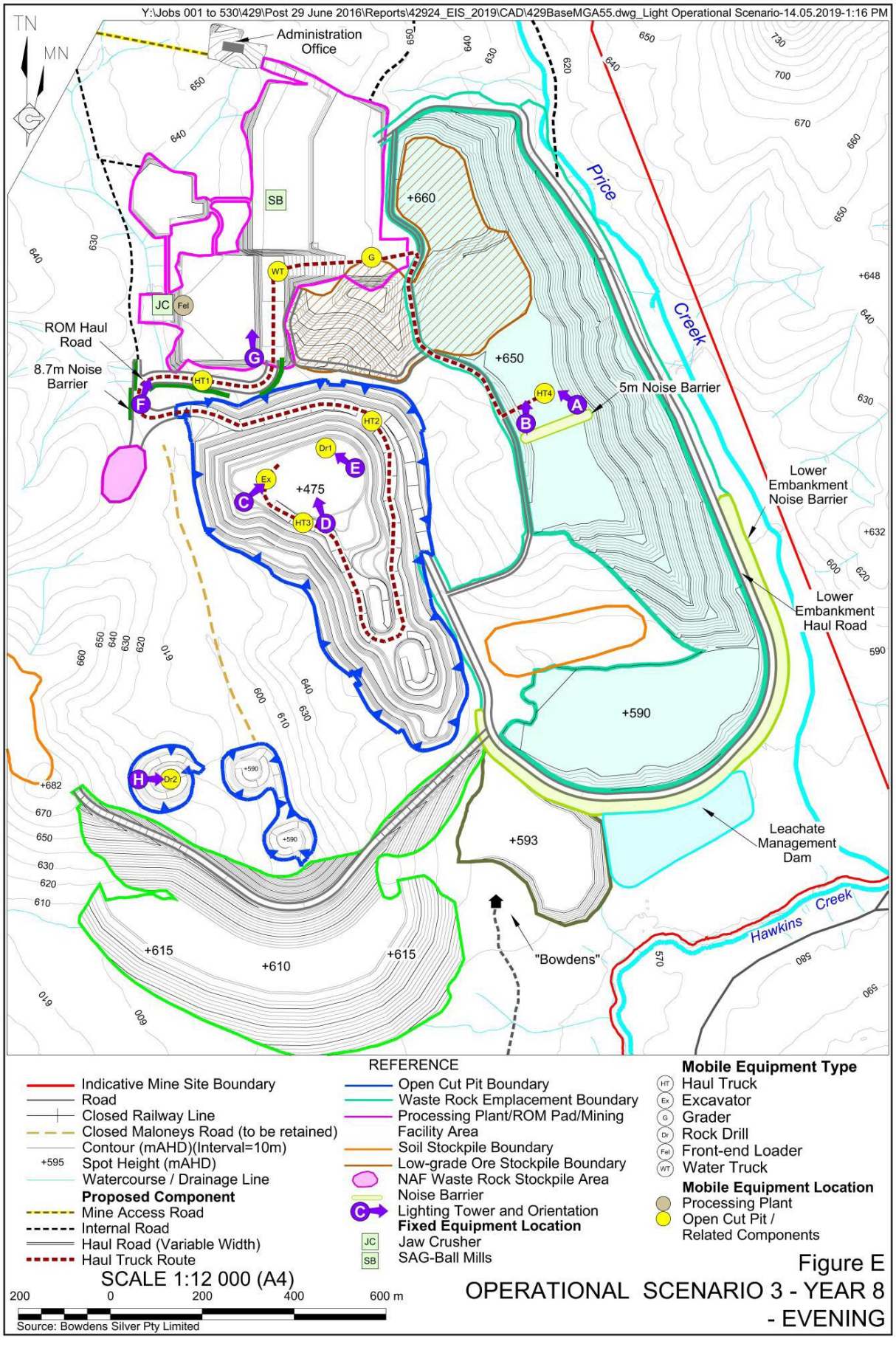
TN
MN
Administration Office
SB
+660
+650
+655
+625
+550
+615
+586
+622
+682
+632
+648
WT
G
JC
Fel
HT1
HT2
HT3
Ex
Dr
A
B
C
D
E
F
5m Noise Barrier
8.7m Noise Barrier
ROM Haul Road
Price Creek
Lower Embankment Noise Barrier
Lower Embankment Haul Road
Leachate Management Dam
"Bowdens"
Hawkins Creek
REFERENCE
Indicative Mine Site Boundary
Road
Closed Railway Line
Closed Maloneys Road (to be retained)
Contour (mAHD)(Interval=10m)
+595 Spot Height (mAHD)
Watercourse / Drainage Line
Proposed Component
Mine Access Road
Internal Road
Haul Road (Variable Width)
Haul Truck Route
Open Cut Pit Boundary
Waste Rock Emplacement Boundary
Processing Plant/ROM Pad/Mining Facility Area
Soil Stockpile Boundary
Low-grade Ore Stockpile Boundary
NAF Waste Rock Stockpile Area
Noise Barrier
Lighting Tower and Orientation
Fixed Equipment Location
JC Jaw Crusher
SB SAG-Ball Mills
Mobile Equipment Type
HT Haul Truck
Ex Excavator
G Grader
Dr Rock Drill
Fel Front-end Loader
WT Water Truck
Mobile Equipment Location
Processing Plant
Open Cut Pit / Related Components
SCALE 1:12 000 (A4)
200 0 200 400 600 m
Source: Bowdens Silver Pty Limited
Figure C
OPERATIONAL SCENARIO 2 - YEAR 3 - EVENING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TN
MN
Administration Office
SB
+660
Price Creek
WT
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ROM Haul Road
8.7m Noise Barrier
HT1
F
+650
HT4
A
B
5m Noise Barrier
HT2
Dr1
E
Ex
C
+475
HT3
D
Lower Embankment Noise Barrier
Lower Embankment Haul Road
+590
H
Dr2
+682
+593
Leachate Management Dam
Hawkins Creek
"Bowdens"
+615
+610
+615
REFERENCE
Indicative Mine Site Boundary
Road
Closed Railway Line
Closed Maloneys Road (to be retained)
Contour (mAHD)(Interval=10m)
+595 Spot Height (mAHD)
Watercourse / Drainage Line
Proposed Component
Mine Access Road
Internal Road
Haul Road (Variable Width)
Haul Truck Route
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Waste Rock Emplacement Boundary
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Soil Stockpile Boundary
Low-grade Ore Stockpile Boundary
NAF Waste Rock Stockpile Area
Noise Barrier
C Lighting Tower and Orientation
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SB SAG-Ball Mills
Mobile Equipment Type
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Ex Excavator
G Grader
Dr Rock Drill
Fel Front-end Loader
WT Water Truck
Mobile Equipment Location
Processing Plant
Open Cut Pit / Related Components
SCALE 1:12 000 (A4)
200 0 200 400 600 m
Source: Bowdens Silver Pty Limited
Figure E
OPERATIONAL SCENARIO 3 - YEAR 8 - EVENING

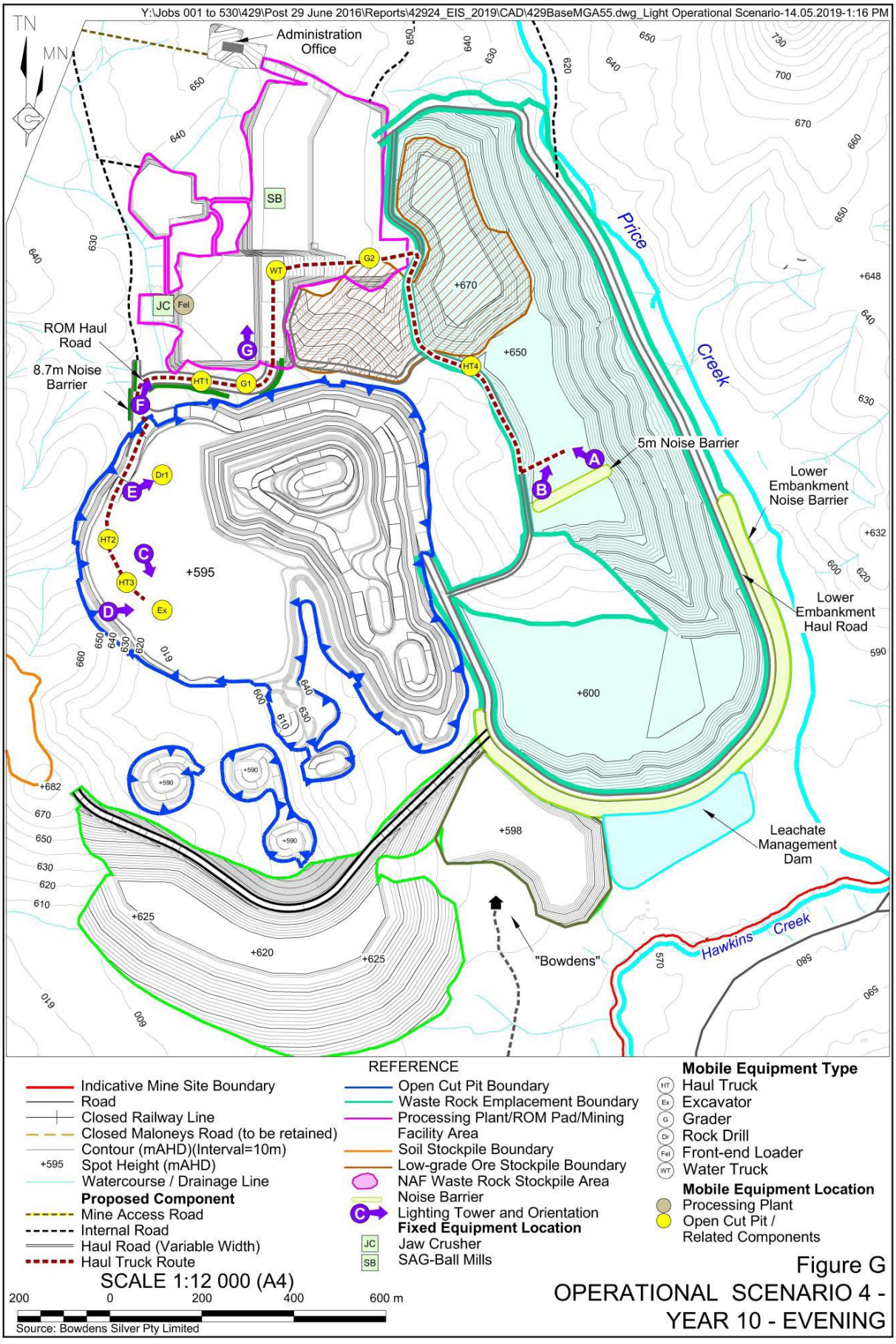
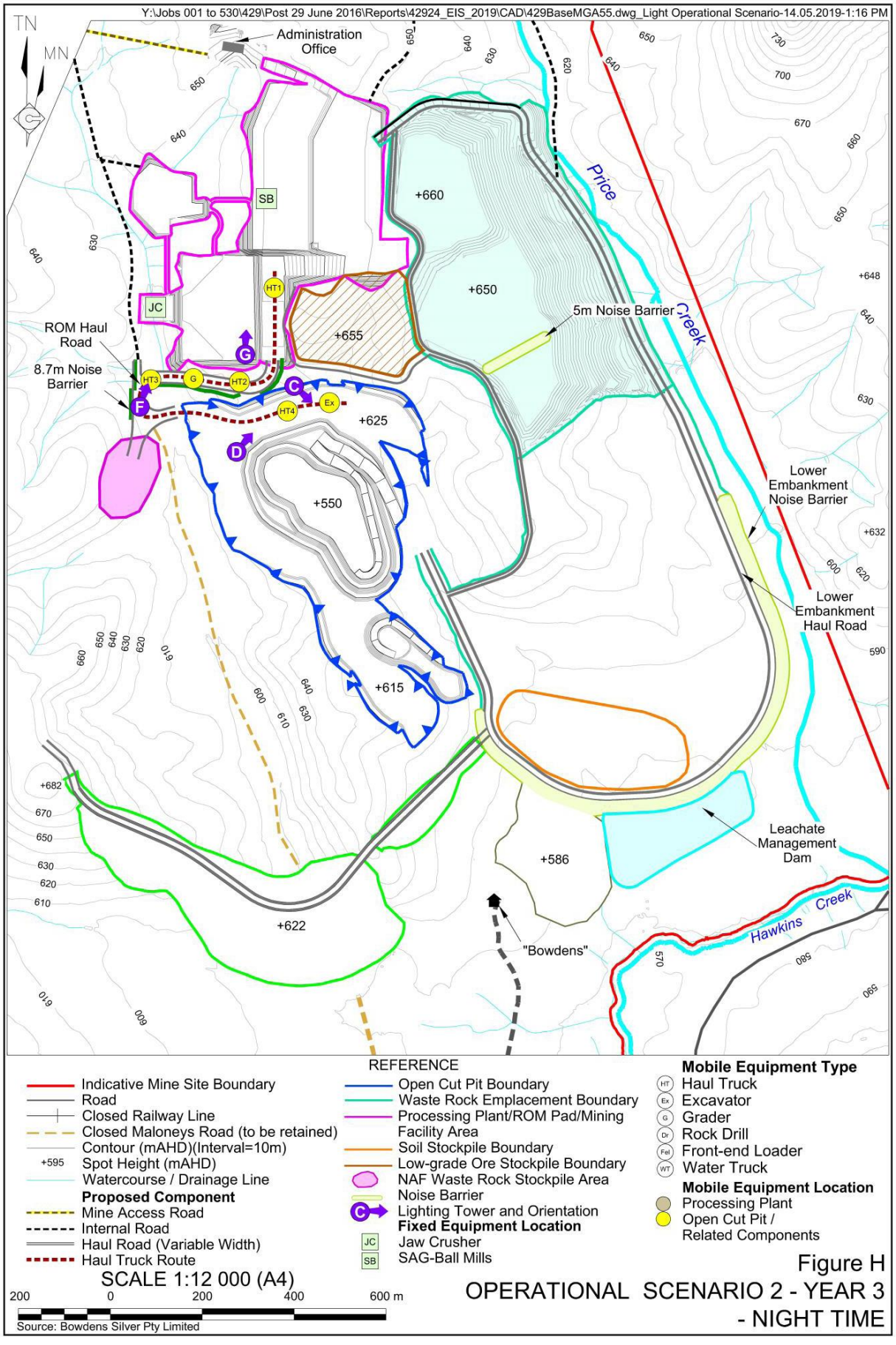


Figure G
OPERATIONAL SCENARIO 4 - YEAR 10 - EVENING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TN
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+625
+550
+615
+622
+586
+682
+632
+648
ROM Haul Road
8.7m Noise Barrier
5m Noise Barrier
Price Creek
Lower Embankment Noise Barrier
Lower Embankment Haul Road
Leachate Management Dam
"Bowdens"
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+595 Spot Height (mAHD)
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Low-grade Ore Stockpile Boundary
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Noise Barrier
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SB SAG-Ball Mills
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G Grader
Dr Rock Drill
Fel Front-end Loader
WT Water Truck
Mobile Equipment Location
Processing Plant
Open Cut Pit / Related Components
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Source: Bowdens Silver Pty Limited
Figure H
OPERATIONAL SCENARIO 2 - YEAR 3 - NIGHT TIME

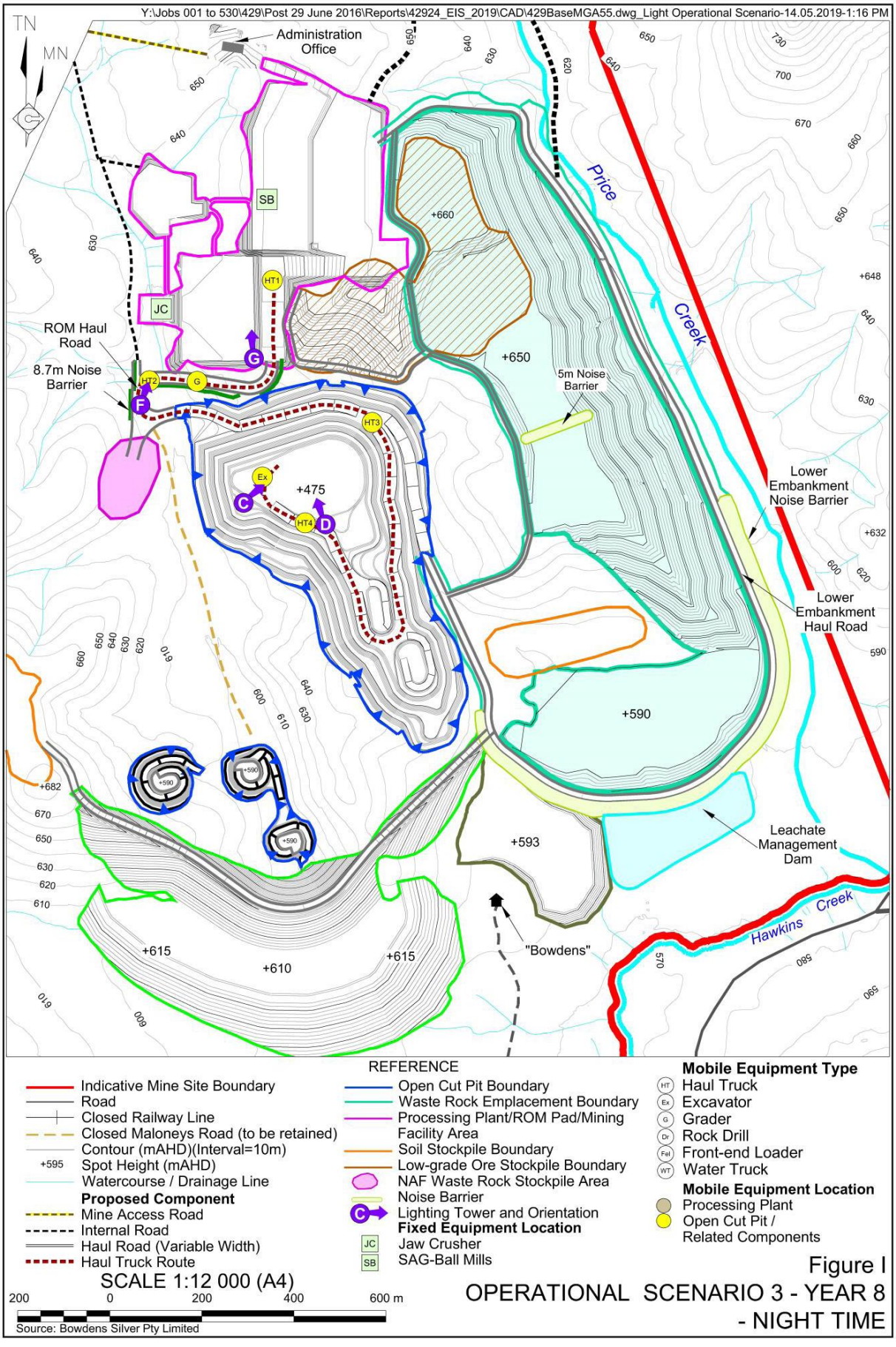
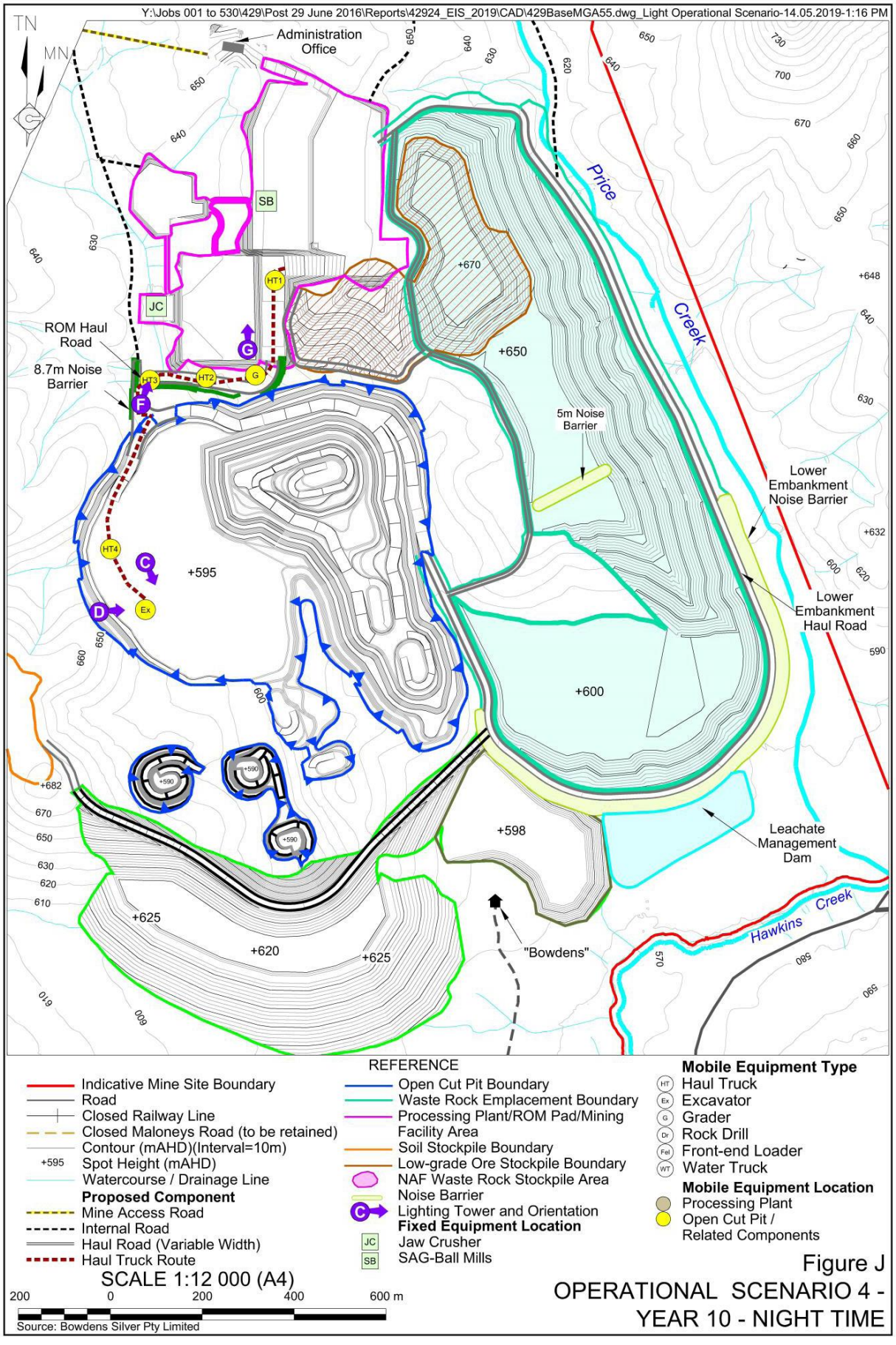


Figure I
OPERATIONAL SCENARIO 3 - YEAR 8 - NIGHT TIME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TN
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HT4
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D
Ex
ROM Haul Road
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5m Noise Barrier
Lower Embankment Noise Barrier
Lower Embankment Haul Road
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+670
+650
+595
+600
+598
+625
+620
+682
+590
+632
+648
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SB SAG-Ball Mills
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Ex Excavator
G Grader
Dr Rock Drill
Fel Front-end Loader
WT Water Truck
Mobile Equipment Location
Processing Plant
Open Cut Pit / Related Components
SCALE 1:12 000 (A4)
200 0 200 400 600 m
Source: Bowdens Silver Pty Limited
Figure J
OPERATIONAL SCENARIO 4 - YEAR 10 - NIGHT TIME

BOWDENS SILVER PROJECT

Coordinates and Elevations of Lighting Plants

Scenario 2 – Year 3 – Evening

	X	Y	Z (m AHD)	Orientation (°)
A	769538	6386146	650	214
B	769433	6386089	650	267
C	769019	6386013	625	43
D	768894	6385869	615	310
E	768881	6385712	615	282
F	768685	6385973	615	290
G	768913	6386082	635	273
H				

Scenario 3 – Year 8 – Evening

	X	Y	Z (m AHD)	Orientation (°)
A	769635	6385972	650	214
B	769523	6385931	650	267
C	768910	6385760	515	321
D	769088	6385713	515	252
E	769152	6385834	505	215
F	768685	6385973	615	290
G	768932	6386074	635	268
H	768700	6385145	600	0

Scenario 4 – Year 10 – Evening

	X	Y	Z (m AHD)	Orientation (°)
A	769672	6385856	650	210
B	769557	6385789	650	285
C	768693	6385649	595	71
D	768616	6385523	600	358
E	768667	6385784	595	333
F	768685	6385973	615	290
G	768918	6386092	635	270
H				

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Annexure B

Proposed Lighting Equipment

(Total No. of pages including blank pages = 16)

B1 Allight MS10K-9 Mine tower

B2 Sylvania Brightline

B3 Metal halide lamp information

B4 Area Floodlight – HPS

B5 Area Floodlight – LED

B6 Typical forward throw floodlights alternatives to the Briteline

Note: This Annexure is only available on the digital version of this document

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HOME TOOLS PRODUCTS PARTS SERVICE CONTACT GO

ALLIGHTSYKES

Home > Products > Lighting Towers > MineSpec MH > MS10K-9

MS10K-9 Features:

ALLIGHT

The MS10K-9 is a 9m lighting tower with five 2000W metal halide lamps and hydraulic operational features, available in skid or single-axle trailer mounted configurations.

- Naturally aspirated, with high power and torque
- Compact designs
- Minimised noise levels and controlled subjective harshness
- Reliable and durable, with low oil consumption and service intervals set at 500 hours as standard
- Seven scopes of lighting direction/positioning
- Highwall overhang capabilities

> Check stock availability

GET A QUOTE

> Locate Dealer > Enquire about this product Download brochure

Share this

Tech specs | Lighting Charts | Optional equipment | Gallery | Product Support | About Allight

Tower Details

Environmental:	**Bunded**	Total Lumens:	**1,000,000**
Light Output in KW:	**10,000**	Lumens per Watt:	**100**
Mast Height m/ft:	**9m/29"**	Fuel Capacity:	**130Ltrs /34 US Gal**

Tower dimensions

Width:	**2100mm/6' 11"**
Length:	**5200mm/17' 1"**
Height:	**2600mm/8' 6"**
Wet weight:	**1980kg/4365lb**

Equipment details

Fuel:	**Diesel**
Engine:	**Perkins 404D-22**
No. Engine Cylinders:	**4**
Engine Aspiration:	**Natural**
Alternator:	**4 pole single bearing brushless**
Hz:	**50**
Tire and Rim size:	**205 R16**
Stabaliser Supports:	**4 x wind down**
Tow Hitch:	**Ball**

Light details

Type of Lights:	**Metal Halide**
Lamp Wattage:	**2,000W**
No. of lights:	**5**
Light Output in KW:	**10,000**
Light Tilt:	**Hydraulic**
Mast Raise / Extension:	**Hydraulic**
Mast Height m/ft:	**9m/29"**
Mast Rotation:	**175°**
Wind Rating Speed:	**100 km/h**

Fuel consumption

Fuel Capacity Ltrs/US Gal:	**130Ltrs /34 US Gal**
Operating hrs @ 100% Load:	**41 Hours**

HOME | TOOLS | PRODUCTS | PARTS | SERVICE | CONTACT | GO

5
Lamp Wattage
2000w

> Hella HypaLume

Related products

MSL24K-7

MS4.5K-M

MS4.5K-9

MS6K-9

ALLIGHTSYKES

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> Science of Lighting	> Lighting Towers	> Engine Repower - Lighting	> Maintenance & Service	> Branch Locator
> Pump Priming Solutions	> Pumps	> Parts Service Kit	> Service Booking	> Media
> Mobile Pump Selector	> Generators	> Parts Enquiry	> Service Enquiry	
> Desktop Pump Selector	> Diesel Engines	> Parts Order	> Troubleshooting - Pumps	
		> Support Network	> Troubleshooting - Lights	

Perth
12 Hoskins Road, Landsdale
Tel: +61 (0)8 9302 7000

Kurri Kurri
125 Mitchell Avenue, Kurri Kurri
Tel: +61 (0)2 4918 7700

Sydney
26 Mount Erin Road, Campbelltown
Tel: +61 (0)2 4629 7800

Auckland
13 McLaughlins Road, Manukau City
Tel: +64 9 278 8300

Brisbane
28 Gassman Drive, Yatala
Tel: +61 (0)7 3442 1122

Melbourne
28–32 Ventura Pl, Dandenong
Tel: +61 (0)3 8795 6801

Newcastle
42 Munibung Road, Cardiff
Tel: +61 (0)2 4954 1400

Christchurch
4 Chinook Place, Hornby South
Tel: +64 3 344 2100

Authorised Resellers of:

ALLIGHT | EG WILSON | Perkins | SYKES

SYLVANIA

Briteline HID Floodlight

The Briteline™ series is a reliable and trusted high performance floodlight range, designed and manufactured in Australia to suit Australasian conditions.

- Timed ignitor as standard
- Over/under slung mounting capability
- Remote Gear tray or Cast box options Elite : 240V or 415V
- High pressure die- cast DA401 aluminium body
- Black polyester powdercoat finish
- Toughened 5mm glass

1 YEAR WARRANTY†

IP65 RATED

NON DIMMABLE

GENERAL SPECIFICATION

DIMMABLE	IP RATING	FINISH	COLOUR	BEAM ANGLE	BEAM DISTRIBUTION	VOLTAGE
No	IP65	Powdercoated	Black	120°	Symmetric	415V

DIMENSIONS H x W x L (MM)	LAMP INCLUDED	LAMP TYPE	OPERATING TEMPERATURE	WINDAGE
540 x 545 x 273	No	HID (Metal Halide)	-5 to 40°C	0.24

UNIQUE SPECIFICATION

ITEM CODE	DESCRIPTION	WATTAGE	LUMEN OUTPUT	COLOUR TEMPERATURE	CRI
XU23102	BLP65 1000MA BT37 LESS GEAR & LAMP	1000W	62235Lm	4100K	
XU32100	BLS65 2000W T8 NO GEAR & LAMP	2000W	139137Lm	4000K	70
XU32101	BLP65 2000W T8 NO GEAR & LAMP	2000W	133460Lm	4000K	70
XUY32100	BLS65 2000W T10 LESS GEAR & LAMP	2000W	153867Lm	4100K	70
XUY32101	BLP65 2000W T10 LESS GEAR & LAMP	2000W	150878Lm	4100K	70

ITEM CODE	IK RATING	WEIGHT	TILT	BASE CAP	LUMINOUS INTENSITY	CIRCUIT WATTAGE
XU23102		12.5kg	60°	RX7s	63540	1070W
XU32100		13kg	70°	RX7s	345200	2115W
XU32101	IK15	13kg	70°	RX7s	200800	2115W
XUY32100		13kg	70°	Cable	283500	2290W
XUY32101		13kg	70°	Cable	183600	2290W

GERARD LIGHTING

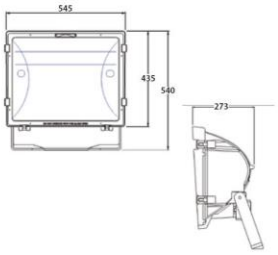
gerardlighting.com.au

SYLVANIA

Briteline HID Floodlight

PRODUCT IMAGES

LINE DRAWINGS

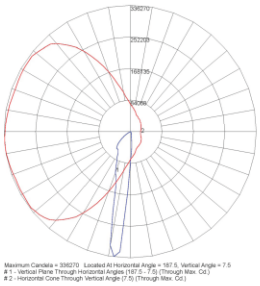


GERARD LIGHTING

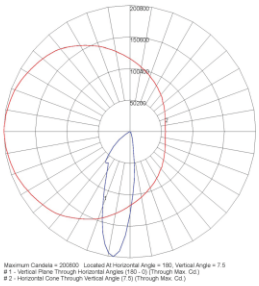
SYLVANIA

Briteline HID Floodlight

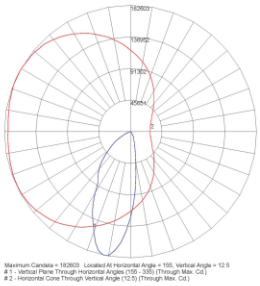
PHOTOMETRICS



XU32100



XU32101



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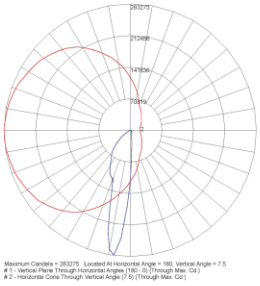


XUY32100

OSRAM

Product datasheet
HQI-T 2000 W/N/SN SUPER

POWERSTAR HQI-T 1000...2000 W | Metal halide lamps for enclosed luminaires

Areas of application

- Factories and workshops
- Sports halls and multi-purpose halls
- Industrial installations
- Airports
- Docks and port facilities
- Marshaling yards, container transshipment facilities
- Approved only for use in enclosed luminaires
- Outdoor applications only in suitable luminaires

Product benefits

- Output of up to 2,000 W
- High efficiency
- E40 screw base for simple lamp handling
- Long lifetime
- UV values significantly below the maximum permitted thresholds to IEC 61167 thanks to UV filter

Product features

- POWERSTAR quartz technology
- Light colors: neutral white (N), daylight (D)

Product datasheet

Technical data

Electrical data

Nominal wattage	2000.00 W
Rated wattage	2030.00 W
Lamp current	9.9 A
PFC capacitor at 50 Hz	37 µF [1]
Nominal voltage	220 V
Ignition voltage	0.75 kVp;1.3 kVp [2]

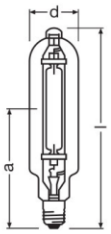
[1] At rated voltage and cos φ ≥ 0.9

[2] Minimum;Maximum

Photometrical data

Rated lamp efficacy (standard condition)	118 lm/W
Rated luminous flux	240000 lm
Color rendering index Ra	63
Color temperature	4550 K
Light color	4600
UV protection	Yes

Dimensions & weight



E40
IEC 7004-24
DIN 49625

Diameter	106.0 mm
Length	430.0 mm
Light center length (LCL)	265.0 mm
Product weight	580.00 g

Temperatures & operating conditions

Maximum permitted outer bulb temperature	500 °C
Maximum permitted base edge temperature	250 °C

Product datasheet

Lifespan

Lifespan B50	5500 h

Additional product data

Base (standard designation)	E40
Product remark	Lamp ignites at an ignition voltage of 0.9...1.3 kVs; lamps must not be operated with 4...5 kV igniters
Design / version	Clear
Mercury content	175.0 mg
Appropriate disposal acc. to WEEE	Yes

Capabilities

Burning position	p60
Enclosed luminaire required	Yes
Dimmable	No

Certificates & standards

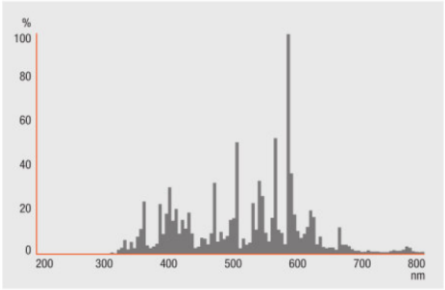
Energy efficiency class	A+
Energy consumption	2233 kWh/1000h

Country specific categorizations

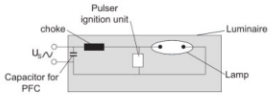
ILCOS	MT/UB-2000/642-E/S/SL-E40-106/430/H

Product datasheet

Light Distribution



Spectral power distribution



Circuit diagram

Logistical Data

Product code	Product description	Packaging unit (Pieces/Unit)	Dimensions (length x width x height)	Volume	Gross weight
4008321979087	HQI-T 2000 W/N/SN SUPER	Shipping carton box 4 Pieces Round wrap	525 mm x 270 mm x 275 mm	38.98 dm^3	3724.00 g

The mentioned product code describes the smallest quantity unit which can be ordered. One shipping unit can contain one or more single products. When placing an order, for the quantity please enter single or multiples of a shipping unit.

Product datasheet

Disclaimer

Subject to change without notice. Errors and omission excepted. Always make sure to use the most recent release.

OSRAM GMBH is distribution partner of LEDVANCE for Digital Lighting Systems and Components

OSRAM

OSRAM GmbH
Marcel-Breuer-Strasse 6
80807 Munich, Germany

HPI-T

HPI-T 2000W/646 E40 220V CRP/4

Quartz metal halide lamps with clear outer bulb

Product data

General Information	
Cap base	E40 [E40]
Burning Position	P75 [Parallel +/-75D or Horizontal(HOR)]
Life to 5% failures (nom.)	3000 h
Life to 10% failures (nom.)	5500 h
Life to 20% failures (nom.)	8000 h
Life to 50% failures (nom.)	12000 h
System description	na [-]

Light Technical	
Colour Code	646 [CCT of 4,600 K]
Lamp Luminous Flux (Min)	182000 lm
Lamp Luminous Flux (Nom)	189000 lm
Colour Designation	Cool White (CW)
Lumen maintenance 10,000 hours (nom.)	60 %
Lumen maintenance 2,000 hours (nom.)	77 %
Lumen maintenance 5,000 hours (nom.)	67 %
Chromaticity coordinate X (nom.)	375
Chromaticity coordinate Y (nom.)	385
Colour Temperature, horizontal (Nom)	4200 K
Lamp Luminous Efficacy EM (Nom)	96 lm/W
Colour Rendering Index,horiz (Nom)	63

Operating and Electrical	
Lamp supply voltage	220 V [220]
Power (Rated) (Nom)	1960.0 W
Lamp current run-up (max.)	28.4 A
Lamp current (EM) (nom.)	16.5 A
Ignition peak voltage (max.)	5000 V
Ignition supply voltage (min.)	198 V
Ignition time (max.)	30 s
Voltage (Max)	140 V
Voltage (Min)	120 V
Voltage (Nom)	130 V

Controls and Dimming	
Dimmable	no

Mechanical and Housing	
Bulb finish	Clear (CL)

Approval and Application	
Energy efficiency label (EEL)	A+
Mercury (Hg) content (nom.)	155 mg
Energy Consumption kWh/1000 h	2156 kWh

Luminaire Design Requirements	
Bulb temperature (max.)	600 °C
Cap base temperature (max.)	300 °C

Product Data	
Full product code	871150018376745

Datasheet, 2018, September 26

data subject to change

HPI-T

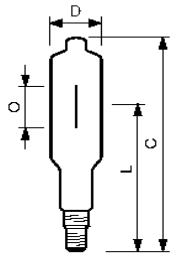
Order product name	HPI-T 2000W/646 E40 220V CRP/4
EAN/UPC – product	8711500183767
Order code	928073609231
Numerator – quantity per pack	1
Numerator – packs per outer box	4

Material no. (12NC)	928073609231
Net weight (piece)	569.000 g
ILCOS Code	MT-2000/46/2B-H-E40-/H

Warnings and Safety

- Use only in totally enclosed luminaire, even during testing (IEC61167, IEC 62035, IEC60598)
- The luminaire must be able to contain hot lamp parts if the lamp ruptures
- For use with control gear designed for high-pressure mercury lamps
- A lamp breaking is extremely unlikely to have any impact on your health. If a lamp breaks, ventilate the room for 30 minutes and remove the parts, preferably with gloves. Put them in a sealed plastic bag and take it to your local waste facilities for recycling. Do not use a vacuum cleaner.

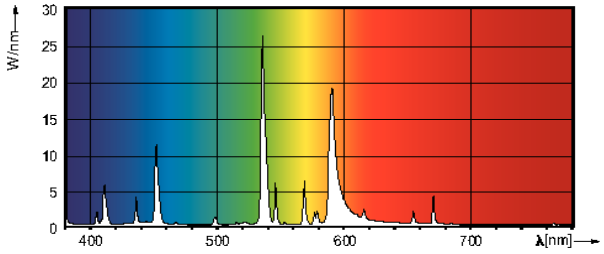
Dimensional drawing



HPI-T 2000W/646 E40 220V

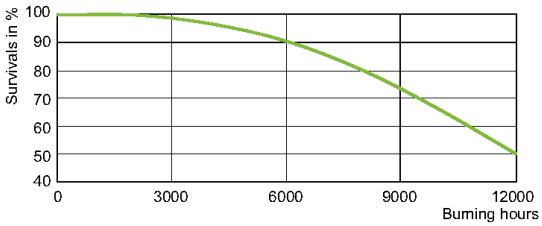
Product	D (max)	O	L	C (max)
HPI-T 2000W/646 E40 220V CRP/4	101.5 mm	89 mm	290 mm	430 mm

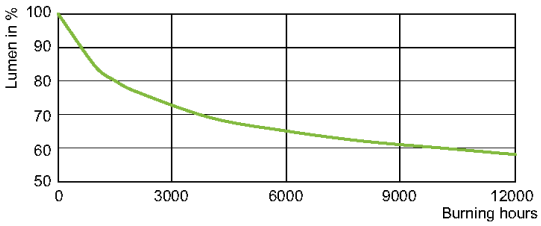
Photometric data



HPI-T

Lifetime

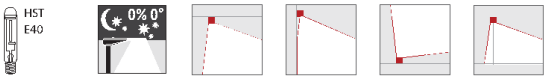




siteco

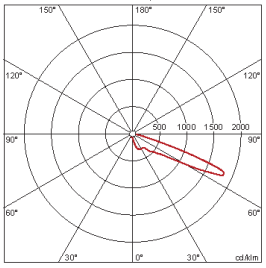
Order No.: 5NA76901UB01 | **GTIN (EAN):** 4050737070643

Product description: A3mxfloodlight,1x600W,HST,w/o.CG,TSG,dir

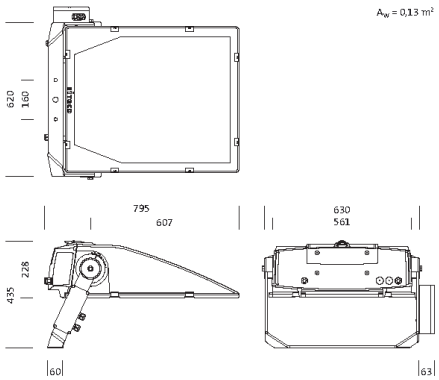


SiCOMPACT® A3 MAXI, floodlight, primary light control with reflector, of aluminium, highly specular, primary optical cover: cover panel, of toughened safety glass, light emission: direct distribution, primary light characteristic: asymmetric, installation type: surface-mounted, for 1x HST, 600W, high pressure sodium vapour lamp, superimposed pulse ignitor, internal, control gear: without control gear, with terminal, 3-pole, max. 2.5mm², mains connection: 230V, AC, 50Hz, luminaire housing, of diecast aluminium, sandblasted, natural, length: 795mm, width: 620mm, height: 228mm, mounting bracket, of steel, galvanised, protection rating (complete): IP65, insulation class (complete): insulation class I (protective earthing), certification: CE, ENEC, VDE, impact resistance: IK08, permissible operating ambient temperature: -20..+40°C, permissible operating ambient temperature for outdoor applications: -20..+30°C, standard: EN 50419, packaging unit: 1 piece

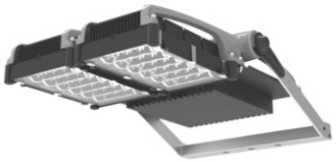
4050737070643
5NA76901UB01
1 x HST-MF 600W/220 LL ϕ 90000 lm



Lamps:	1x HST 600W
Socket:	E40
Wt. (kg):	21.9
GTIN (EAN):	4050737070643



SYLVANIA



Briteline Raptor 600

LED

5 YEAR WARRANTY†

IP66 RATED

DIMMABLE

The NEW BENCHMARK in LED sports and area lighting. Designed by the GLG team to suit Australian regulations and operating conditions. The Raptor range combines world-class performance, advanced energy efficiency and new optical technology plus lower ongoing maintenance in one sleek package.

- Raptor's optical reflector system delivers maximum performance while controlling spill light and minimising glare.
- High lumen output with minimal power use for energy cost savings and improved sustainability.
- Designed in Australia by the GLG Engineering Team.
- Manufactured from precision die cast aluminium frames housing two individual IP66 modules.
- Allows for over and under-slinging on the pole cross-arm and rotation around the fitting to assist precision aiming.
- Integrated IP67 control gear designed to operate with 0-10V control systems.

GENERAL SPECIFICATION

LUMEN OUTPUT	COLOUR TEMPERATURE	CRI	DIMMABLE	DIMMING TECHNOLOGY	IP RATING	IK RATING
68000Lm	5700K	70	Yes	0-10Vdc	IP66	IK06

FINISH	COLOUR	WEIGHT	BEAM DISTRIBUTION	DIMENSIONS H x W x L (MM)	CIRCUIT WATTAGE	HEAT SINK MATERIAL
Powdercoated	Grey/Black	25kg	Asymmetric	171 x 594 x 741	660W	Aluminium (Die Cast)

LAMP TYPE	OPERATING TEMPERATURE	WINDAGE
LED (PCBA)	-40 to 40°C	0.17

GERARD LIGHTING

gerardlighting.com.au

SYLVANIA

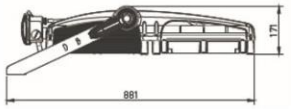
Briteline Raptor 600

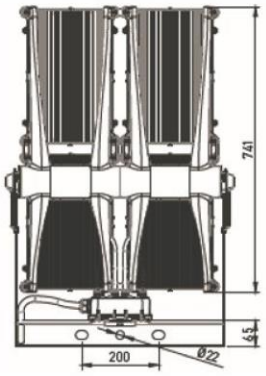
UNIQUE SPECIFICATION

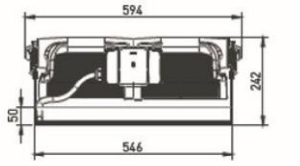
ITEM CODE	DESCRIPTION	VOLTAGE	TILT
SR2H757A1EIL	BRITELINE LED RAPTOR 600W A1 CRI70 CCT5700K 240V TRUNNION AR	240V	13°
SR2H757A1FIL	BRITELINE LED RAPTOR 600W A1 CRI70 CCT5700K 415V TRUNNION AR	415V	
SR2H757A2EIL	BRITELINE LED RAPTOR 600W A2 CRI70 CCT5700K 240V TRUNNION AR	240V	
SR2H757A2FIL	BRITELINE LED RAPTOR 600W A2 CRI70 CCT5700K 415V TRUNNION AR	415V	
SR2H757A3EIL	BRITELINE LED RAPTOR 600W A3 CRI70 CCT5700K 240V TRUNNION AR	240V	
SR2H757A3FIL	BRITELINE LED RAPTOR 600W A3 CRI70 CCT5700K 415V TRUNNION AR	415V	

PRODUCT IMAGES

LINE DRAWINGS







GERARD LIGHTING

Annexure C

Lighting Calculation

(Total No. of pages including blank pages = 44)

C1 Lighting Model

C2 Calculation Summaries

Note: This Appendix is only available on the digital version of this document

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Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 0 deg
9/06/2019 10:05:04 PM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0016
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0130
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0018
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0015
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0015
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0019	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0016	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0014	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0037	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
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ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000	

ObtrusiveLight_1_III_Seg58	**PASS**	0.0011
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0007
ObtrusiveLight_1_III_Seg61	**PASS**	0.0021
ObtrusiveLight_1_III_Seg62	**PASS**	0.0021

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (50)
Test Results: **FAIL**

Failed Luminaire Locations (35):

Lum.No.	Label	Cd	Tilt	Roll	Spin
1	BLP65 WB 2000W T10 glass flat	1003	0	0	0
2	BLP65 WB 2000W T10 glass flat	1003	0	0	0
3	BLP65 WB 2000W T10 glass flat	1003	0	0	0
4	BLP65 WB 2000W T10 glass flat	1003	0	0	0
5	BLP65 WB 2000W T10 glass flat	1003	0	0	0
6	BLP65 WB 2000W T10 glass flat	1003	0	0	0
7	BLP65 WB 2000W T10 glass flat	1003	0	0	0
8	BLP65 WB 2000W T10 glass flat	1003	0	0	0
9	BLP65 WB 2000W T10 glass flat	1003	0	0	0
10	BLP65 WB 2000W T10 glass flat	1003	0	0	0
11	BLP65 WB 2000W T10 glass flat	1003	0	0	0
12	BLP65 WB 2000W T10 glass flat	1003	0	0	0
13	BLP65 WB 2000W T10 glass flat	1003	0	0	0
14	BLP65 WB 2000W T10 glass flat	1003	0	0	0
15	BLP65 WB 2000W T10 glass flat	1003	0	0	0
16	BLP65 WB 2000W T10 glass flat	1003	0	0	0
17	BLP65 WB 2000W T10 glass flat	1003	0	0	0
18	BLP65 WB 2000W T10 glass flat	1003	0	0	0
19	BLP65 WB 2000W T10 glass flat	1003	0	0	0
20	BLP65 WB 2000W T10 glass flat	1003	0	0	0
21	BLP65 WB 2000W T10 glass flat	1003	0	0	0
22	BLP65 WB 2000W T10 glass flat	1003	0	0	0
23	BLP65 WB 2000W T10 glass flat	1003	0	0	0
24	BLP65 WB 2000W T10 glass flat	1003	0	0	0
25	BLP65 WB 2000W T10 glass flat	1003	0	0	0
26	BLP65 WB 2000W T10 glass flat	1003	0	0	0
27	BLP65 WB 2000W T10 glass flat	1003	0	0	0
28	BLP65 WB 2000W T10 glass flat	1003	0	0	0
29	BLP65 WB 2000W T10 glass flat	1003	0	0	0
30	BLP65 WB 2000W T10 glass flat	1003	0	0	0
31	BLP65 WB 2000W T10 glass flat	1003	0	0	0
32	BLP65 WB 2000W T10 glass flat	1003	0	0	0
33	BLP65 WB 2000W T10 glass flat	1003	0	0	0
34	BLP65 WB 2000W T10 glass flat	1003	0	0	0
35	BLP65 WB 2000W T10 glass flat	1003	0	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 0 deg A
11/06/2019 9:16:45 AM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		PASS	0.0016
ObtrusiveLight_1_Ill_Seg2		PASS	0.0006
ObtrusiveLight_1_Ill_Seg3		PASS	0.0130
ObtrusiveLight_1_Ill_Seg4		PASS	0.0014
ObtrusiveLight_1_Ill_Seg5		PASS	0.0013
ObtrusiveLight_1_Ill_Seg6		PASS	0.0018
ObtrusiveLight_1_Ill_Seg7		PASS	0.0014
ObtrusiveLight_1_Ill_Seg8		PASS	0.0015
ObtrusiveLight_1_Ill_Seg9		PASS	0.0015
ObtrusiveLight_1_Ill_Seg10	PASS	0.0019	
ObtrusiveLight_1_Ill_Seg11	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg12	PASS	0.0016	
ObtrusiveLight_1_Ill_Seg13	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg14	PASS	0.0004	
ObtrusiveLight_1_Ill_Seg15	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg16	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg17	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg18	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg19	PASS	0.0014	
ObtrusiveLight_1_Ill_Seg20	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg21	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg22	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg23	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg24	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg25	PASS	0.0009	
ObtrusiveLight_1_Ill_Seg26	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg27	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg28	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg29	PASS	0.0037	
ObtrusiveLight_1_Ill_Seg30	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg31	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg32	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg33	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg34	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg35	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg36	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg37	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg38	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg39	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg40	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg41	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg42	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg43	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg44	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg45	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg46	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg47	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg48	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg49	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg50	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg51	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg52	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg53	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg54	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg55	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg56	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg57	PASS	0.0000	

ObtrusiveLight_1_III_Seg58	**PASS**	0.0011
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0007
ObtrusiveLight_1_III_Seg61	**PASS**	0.0021
ObtrusiveLight_1_III_Seg62	**PASS**	0.0021

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **FAIL**

Failed Luminaire Locations (51):

Lum.No.	Label	Cd	Tilt	Roll	Spin
1	BLP65 WB 2000W T10 glass flat	1003	0	0	0
2	BLP65 WB 2000W T10 glass flat	1003	0	0	0
3	BLP65 WB 2000W T10 glass flat	1003	0	0	0
4	BLP65 WB 2000W T10 glass flat	1003	0	0	0
5	BLP65 WB 2000W T10 glass flat	1003	0	0	0
6	BLP65 WB 2000W T10 glass flat	1003	0	0	0
7	BLP65 WB 2000W T10 glass flat	1003	0	0	0
8	BLP65 WB 2000W T10 glass flat	1003	0	0	0
9	BLP65 WB 2000W T10 glass flat	1003	0	0	0
10	BLP65 WB 2000W T10 glass flat	1003	0	0	0
11	BLP65 WB 2000W T10 glass flat	1003	0	0	0
12	BLP65 WB 2000W T10 glass flat	1003	0	0	0
13	BLP65 WB 2000W T10 glass flat	1003	0	0	0
14	BLP65 WB 2000W T10 glass flat	1003	0	0	0
15	BLP65 WB 2000W T10 glass flat	1003	0	0	0
16	BLP65 WB 2000W T10 glass flat	1003	0	0	0
17	BLP65 WB 2000W T10 glass flat	1003	0	0	0
18	BLP65 WB 2000W T10 glass flat	1003	0	0	0
19	BLP65 WB 2000W T10 glass flat	1003	0	0	0
20	BLP65 WB 2000W T10 glass flat	1003	0	0	0
21	BLP65 WB 2000W T10 glass flat	1003	0	0	0
22	BLP65 WB 2000W T10 glass flat	1003	0	0	0
23	BLP65 WB 2000W T10 glass flat	1003	0	0	0
24	BLP65 WB 2000W T10 glass flat	1003	0	0	0
25	BLP65 WB 2000W T10 glass flat	1003	0	0	0
26	BLP65 WB 2000W T10 glass flat	1003	0	0	0
27	BLP65 WB 2000W T10 glass flat	1003	0	0	0
28	BLP65 WB 2000W T10 glass flat	1003	0	0	0
29	BLP65 WB 2000W T10 glass flat	1003	0	0	0
30	BLP65 WB 2000W T10 glass flat	1003	0	0	0
31	BLP65 WB 2000W T10 glass flat	1003	0	0	0
32	BLP65 WB 2000W T10 glass flat	1003	0	0	0
33	BLP65 WB 2000W T10 glass flat	1003	0	0	0
34	BLP65 WB 2000W T10 glass flat	1003	0	0	0
35	BLP65 WB 2000W T10 glass flat	1003	0	0	0
51	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
52	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
53	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
54	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
55	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
56	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
57	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
58	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
59	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
60	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
61	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
62	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
63	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
64	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
65	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0
66	SR4H757A2 Raptor 1270W NB gla	1717	0	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Non-Curfew L1
Filename: L159D Bowens Silver AGI1 190609 0 deg
9/06/2019 10:03:53 PM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0016
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0130
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0018
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0015
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0015
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0019	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0016	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0014	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0037	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0003	

ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0001
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0001
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg58	**PASS**	0.0011
ObtrusiveLight_1_Ill_Seg59	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg60	**PASS**	0.0007
ObtrusiveLight_1_Ill_Seg61	**PASS**	0.0021
ObtrusiveLight_1_Ill_Seg62	**PASS**	0.0021

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 2500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (50)
Test Results: **PASS**

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Non-Curfew L1
Filename: L159D Bowens Silver AGI1 190609 0 deg A
11/06/2019 9:18:54 AM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0016
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0130
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0018
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0015
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0015
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0019	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0016	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0014	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0037	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000	

ObtrusiveLight_1_III_Seg58	**PASS**	0.0011
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0007
ObtrusiveLight_1_III_Seg61	**PASS**	0.0021
ObtrusiveLight_1_III_Seg62	**PASS**	0.0021

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 2500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **PASS**

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 10 deg
9/06/2019 10:21:32 PM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0028
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0026
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0117
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0005
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0005
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0005
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0012	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0005	

ObtrusiveLight_1_III_Seg54	**PASS**	0.0005
ObtrusiveLight_1_III_Seg55	**PASS**	0.0000
ObtrusiveLight_1_III_Seg56	**PASS**	0.0000
ObtrusiveLight_1_III_Seg57	**PASS**	0.0000
ObtrusiveLight_1_III_Seg58	**PASS**	0.0014
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0011
ObtrusiveLight_1_III_Seg61	**PASS**	0.0029
ObtrusiveLight_1_III_Seg62	**PASS**	0.0046

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (50)
Test Results: **FAIL**

Failed Luminaire Locations (50):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	5599	10	0	0
37	A2 Midi HST 250 W	5599	10	0	0
38	A2 Midi HST 250 W	5599	10	0	0
39	A2 Midi HST 250 W	5599	10	0	0
40	A2 Midi HST 250 W	5599	10	0	0
41	A2 Midi HST 250 W	5599	10	0	0
42	A2 Midi HST 250 W	5599	10	0	0
43	A2 Midi HST 250 W	5599	10	0	0
44	A2 Midi HST 250 W	5599	10	0	0
45	A2 Midi HST 250 W	5599	10	0	0
46	A2 Midi HST 250 W	5599	10	0	0
47	A2 Midi HST 250 W	5599	10	0	0
48	A2 Midi HST 250 W	5599	10	0	0
49	A2 Midi HST 250 W	5599	10	0	0
50	A2 Midi HST 250 W	5599	10	0	0
1	BLP65 WB 2000W T10 glass flat	1400	10	0	0
2	BLP65 WB 2000W T10 glass flat	1400	10	0	0
3	BLP65 WB 2000W T10 glass flat	1400	10	0	0
4	BLP65 WB 2000W T10 glass flat	1400	10	0	0
5	BLP65 WB 2000W T10 glass flat	1400	10	0	0
6	BLP65 WB 2000W T10 glass flat	1400	10	0	0
7	BLP65 WB 2000W T10 glass flat	1400	10	0	0
8	BLP65 WB 2000W T10 glass flat	1400	10	0	0
9	BLP65 WB 2000W T10 glass flat	1400	10	0	0
10	BLP65 WB 2000W T10 glass flat	1400	10	0	0
11	BLP65 WB 2000W T10 glass flat	1400	10	0	0
12	BLP65 WB 2000W T10 glass flat	1400	10	0	0
13	BLP65 WB 2000W T10 glass flat	1400	10	0	0
14	BLP65 WB 2000W T10 glass flat	1400	10	0	0
15	BLP65 WB 2000W T10 glass flat	1400	10	0	0
16	BLP65 WB 2000W T10 glass flat	1400	10	0	0
17	BLP65 WB 2000W T10 glass flat	1400	10	0	0
18	BLP65 WB 2000W T10 glass flat	1400	10	0	0
19	BLP65 WB 2000W T10 glass flat	1400	10	0	0
20	BLP65 WB 2000W T10 glass flat	1400	10	0	0
21	BLP65 WB 2000W T10 glass flat	1400	10	0	0
22	BLP65 WB 2000W T10 glass flat	1400	10	0	0
23	BLP65 WB 2000W T10 glass flat	1400	10	0	0
24	BLP65 WB 2000W T10 glass flat	1400	10	0	0
25	BLP65 WB 2000W T10 glass flat	1400	10	0	0
26	BLP65 WB 2000W T10 glass flat	1400	10	0	0
27	BLP65 WB 2000W T10 glass flat	1400	10	0	0
28	BLP65 WB 2000W T10 glass flat	1400	10	0	0
29	BLP65 WB 2000W T10 glass flat	1400	10	0	0

30	BLP65 WB 2000W T10 glass flat	1400	10	0	0
31	BLP65 WB 2000W T10 glass flat	1400	10	0	0
32	BLP65 WB 2000W T10 glass flat	1400	10	0	0
33	BLP65 WB 2000W T10 glass flat	1400	10	0	0
34	BLP65 WB 2000W T10 glass flat	1400	10	0	0
35	BLP65 WB 2000W T10 glass flat	1400	10	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 10 deg A
11/06/2019 4:04:29 PM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		PASS	0.0084
ObtrusiveLight_1_Ill_Seg2		PASS	0.0113
ObtrusiveLight_1_Ill_Seg3		PASS	0.0175
ObtrusiveLight_1_Ill_Seg4		PASS	0.0016
ObtrusiveLight_1_Ill_Seg5		PASS	0.0015
ObtrusiveLight_1_Ill_Seg6		PASS	0.0019
ObtrusiveLight_1_Ill_Seg7		PASS	0.0015
ObtrusiveLight_1_Ill_Seg8		PASS	0.0015
ObtrusiveLight_1_Ill_Seg9		PASS	0.0015
ObtrusiveLight_1_Ill_Seg10	PASS	0.0020	
ObtrusiveLight_1_Ill_Seg11	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg12	PASS	0.0017	
ObtrusiveLight_1_Ill_Seg13	PASS	0.0014	
ObtrusiveLight_1_Ill_Seg14	PASS	0.0004	
ObtrusiveLight_1_Ill_Seg15	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg16	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg17	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg18	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg19	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg20	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg21	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg22	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg23	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg24	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg25	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg26	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg27	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg28	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg29	PASS	0.0031	
ObtrusiveLight_1_Ill_Seg30	PASS	0.0022	
ObtrusiveLight_1_Ill_Seg31	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg32	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg33	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg34	PASS	0.0009	
ObtrusiveLight_1_Ill_Seg35	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg36	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg37	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg38	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg39	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg40	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg41	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg42	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg43	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg44	PASS	0.0007	
ObtrusiveLight_1_Ill_Seg45	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg46	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg47	PASS	0.0007	
ObtrusiveLight_1_Ill_Seg48	PASS	0.0009	
ObtrusiveLight_1_Ill_Seg49	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg50	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg51	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg52	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg53	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg54	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg55	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg56	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg57	PASS	0.0000	

ObtrusiveLight_1_III_Seg58	**PASS**	0.0017
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0011
ObtrusiveLight_1_III_Seg61	**PASS**	0.0041
ObtrusiveLight_1_III_Seg62	**PASS**	0.0176

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **FAIL**

Failed Luminaire Locations (66):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	5599	10	0	0
37	A2 Midi HST 250 W	5599	10	0	0
38	A2 Midi HST 250 W	5599	10	0	0
39	A2 Midi HST 250 W	5599	10	0	0
40	A2 Midi HST 250 W	5599	10	0	0
41	A2 Midi HST 250 W	5599	10	0	0
42	A2 Midi HST 250 W	5599	10	0	0
43	A2 Midi HST 250 W	5599	10	0	0
44	A2 Midi HST 250 W	5599	10	0	0
45	A2 Midi HST 250 W	5599	10	0	0
46	A2 Midi HST 250 W	5599	10	0	0
47	A2 Midi HST 250 W	5599	10	0	0
48	A2 Midi HST 250 W	5599	10	0	0
49	A2 Midi HST 250 W	5599	10	0	0
50	A2 Midi HST 250 W	5599	10	0	0
1	BLP65 WB 2000W T10 glass flat	1400	10	0	0
2	BLP65 WB 2000W T10 glass flat	1400	10	0	0
3	BLP65 WB 2000W T10 glass flat	1400	10	0	0
4	BLP65 WB 2000W T10 glass flat	1400	10	0	0
5	BLP65 WB 2000W T10 glass flat	1400	10	0	0
6	BLP65 WB 2000W T10 glass flat	1400	10	0	0
7	BLP65 WB 2000W T10 glass flat	1400	10	0	0
8	BLP65 WB 2000W T10 glass flat	1400	10	0	0
9	BLP65 WB 2000W T10 glass flat	1400	10	0	0
10	BLP65 WB 2000W T10 glass flat	1400	10	0	0
11	BLP65 WB 2000W T10 glass flat	1400	10	0	0
12	BLP65 WB 2000W T10 glass flat	1400	10	0	0
13	BLP65 WB 2000W T10 glass flat	1400	10	0	0
14	BLP65 WB 2000W T10 glass flat	1400	10	0	0
15	BLP65 WB 2000W T10 glass flat	1400	10	0	0
16	BLP65 WB 2000W T10 glass flat	1400	10	0	0
17	BLP65 WB 2000W T10 glass flat	1400	10	0	0
18	BLP65 WB 2000W T10 glass flat	1400	10	0	0
19	BLP65 WB 2000W T10 glass flat	1400	10	0	0
20	BLP65 WB 2000W T10 glass flat	1400	10	0	0
21	BLP65 WB 2000W T10 glass flat	1400	10	0	0
22	BLP65 WB 2000W T10 glass flat	1400	10	0	0
23	BLP65 WB 2000W T10 glass flat	1400	10	0	0
24	BLP65 WB 2000W T10 glass flat	1400	10	0	0
25	BLP65 WB 2000W T10 glass flat	1400	10	0	0
26	BLP65 WB 2000W T10 glass flat	1400	10	0	0
27	BLP65 WB 2000W T10 glass flat	1400	10	0	0
28	BLP65 WB 2000W T10 glass flat	1400	10	0	0
29	BLP65 WB 2000W T10 glass flat	1400	10	0	0
30	BLP65 WB 2000W T10 glass flat	1400	10	0	0
31	BLP65 WB 2000W T10 glass flat	1400	10	0	0
32	BLP65 WB 2000W T10 glass flat	1400	10	0	0
33	BLP65 WB 2000W T10 glass flat	1400	10	0	0
34	BLP65 WB 2000W T10 glass flat	1400	10	0	0
35	BLP65 WB 2000W T10 glass flat	1400	10	0	0
51	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
52	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0

53	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
54	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
55	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
56	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
57	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
58	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
59	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
60	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
61	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
62	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
63	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
64	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
65	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
66	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.1 %
Test Results: **FAIL**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Non-Curfew L1
Filename: L159D Bowens Silver AGI1 190609 10 deg
9/06/2019 10:19:54 PM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0028
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0026
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0117
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0005
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0005
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0005
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0012	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000	

ObtrusiveLight_1_Ill_Seg58	**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg59	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg60	**PASS**	0.0011
ObtrusiveLight_1_Ill_Seg61	**PASS**	0.0029
ObtrusiveLight_1_Ill_Seg62	**PASS**	0.0046

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 2500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (50)
Test Results: **FAIL**

Failed Luminaire Locations (15):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	5599	10	0	0
37	A2 Midi HST 250 W	5599	10	0	0
38	A2 Midi HST 250 W	5599	10	0	0
39	A2 Midi HST 250 W	5599	10	0	0
40	A2 Midi HST 250 W	5599	10	0	0
41	A2 Midi HST 250 W	5599	10	0	0
42	A2 Midi HST 250 W	5599	10	0	0
43	A2 Midi HST 250 W	5599	10	0	0
44	A2 Midi HST 250 W	5599	10	0	0
45	A2 Midi HST 250 W	5599	10	0	0
46	A2 Midi HST 250 W	5599	10	0	0
47	A2 Midi HST 250 W	5599	10	0	0
48	A2 Midi HST 250 W	5599	10	0	0
49	A2 Midi HST 250 W	5599	10	0	0
50	A2 Midi HST 250 W	5599	10	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Non-Curfew L1
Filename: L159D Bowens Silver AGI1 190609 10 deg A
11/06/2019 4:00:38 PM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		PASS	0.0084
ObtrusiveLight_1_Ill_Seg2		PASS	0.0113
ObtrusiveLight_1_Ill_Seg3		PASS	0.0175
ObtrusiveLight_1_Ill_Seg4		PASS	0.0016
ObtrusiveLight_1_Ill_Seg5		PASS	0.0015
ObtrusiveLight_1_Ill_Seg6		PASS	0.0019
ObtrusiveLight_1_Ill_Seg7		PASS	0.0015
ObtrusiveLight_1_Ill_Seg8		PASS	0.0015
ObtrusiveLight_1_Ill_Seg9		PASS	0.0015
ObtrusiveLight_1_Ill_Seg10	PASS	0.0020	
ObtrusiveLight_1_Ill_Seg11	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg12	PASS	0.0017	
ObtrusiveLight_1_Ill_Seg13	PASS	0.0014	
ObtrusiveLight_1_Ill_Seg14	PASS	0.0004	
ObtrusiveLight_1_Ill_Seg15	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg16	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg17	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg18	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg19	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg20	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg21	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg22	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg23	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg24	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg25	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg26	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg27	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg28	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg29	PASS	0.0031	
ObtrusiveLight_1_Ill_Seg30	PASS	0.0022	
ObtrusiveLight_1_Ill_Seg31	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg32	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg33	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg34	PASS	0.0009	
ObtrusiveLight_1_Ill_Seg35	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg36	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg37	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg38	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg39	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg40	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg41	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg42	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg43	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg44	PASS	0.0007	
ObtrusiveLight_1_Ill_Seg45	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg46	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg47	PASS	0.0007	
ObtrusiveLight_1_Ill_Seg48	PASS	0.0009	
ObtrusiveLight_1_Ill_Seg49	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg50	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg51	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg52	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg53	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg54	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg55	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg56	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg57	PASS	0.0000	

ObtrusiveLight_1_Ill_Seg58	**PASS**	0.0017
ObtrusiveLight_1_Ill_Seg59	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg60	**PASS**	0.0011
ObtrusiveLight_1_Ill_Seg61	**PASS**	0.0041
ObtrusiveLight_1_Ill_Seg62	**PASS**	0.0176

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 2500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **FAIL**

Failed Luminaire Locations (31):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	5599	10	0	0
37	A2 Midi HST 250 W	5599	10	0	0
38	A2 Midi HST 250 W	5599	10	0	0
39	A2 Midi HST 250 W	5599	10	0	0
40	A2 Midi HST 250 W	5599	10	0	0
41	A2 Midi HST 250 W	5599	10	0	0
42	A2 Midi HST 250 W	5599	10	0	0
43	A2 Midi HST 250 W	5599	10	0	0
44	A2 Midi HST 250 W	5599	10	0	0
45	A2 Midi HST 250 W	5599	10	0	0
46	A2 Midi HST 250 W	5599	10	0	0
47	A2 Midi HST 250 W	5599	10	0	0
48	A2 Midi HST 250 W	5599	10	0	0
49	A2 Midi HST 250 W	5599	10	0	0
50	A2 Midi HST 250 W	5599	10	0	0
51	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
52	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
53	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
54	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
55	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
56	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
57	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
58	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
59	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
60	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
61	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
62	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
63	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
64	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
65	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0
66	SR4H757A2 Raptor 1270W NB gla	61832	10	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.1 %
Test Results: **FAIL**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 2_5 deg A
11/06/2019 9:36:48 AM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0039
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0052
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0129
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0011
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0009
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0015
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0011
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0012
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0011
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0013	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0012	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0025	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0016	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000	

ObtrusiveLight_1_III_Seg58	**PASS**	0.0010
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0007
ObtrusiveLight_1_III_Seg61	**PASS**	0.0021
ObtrusiveLight_1_III_Seg62	**PASS**	0.0055

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **FAIL**

Failed Luminaire Locations (66):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	1064	2.5	0	0
37	A2 Midi HST 250 W	1064	2.5	0	0
38	A2 Midi HST 250 W	1064	2.5	0	0
39	A2 Midi HST 250 W	1064	2.5	0	0
40	A2 Midi HST 250 W	1064	2.5	0	0
41	A2 Midi HST 250 W	1064	2.5	0	0
42	A2 Midi HST 250 W	1064	2.5	0	0
43	A2 Midi HST 250 W	1064	2.5	0	0
44	A2 Midi HST 250 W	1064	2.5	0	0
45	A2 Midi HST 250 W	1064	2.5	0	0
46	A2 Midi HST 250 W	1064	2.5	0	0
47	A2 Midi HST 250 W	1064	2.5	0	0
48	A2 Midi HST 250 W	1064	2.5	0	0
49	A2 Midi HST 250 W	1064	2.5	0	0
50	A2 Midi HST 250 W	1064	2.5	0	0
1	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
2	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
3	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
4	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
5	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
6	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
7	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
8	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
9	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
10	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
11	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
12	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
13	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
14	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
15	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
16	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
17	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
18	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
19	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
20	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
21	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
22	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
23	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
24	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
25	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
26	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
27	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
28	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
29	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
30	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
31	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
32	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
33	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
34	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
35	BLP65 WB 2000W T10 glass flat	883	2.5	0	0
51	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
52	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0

53	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
54	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
55	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
56	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
57	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
58	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
59	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
60	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
61	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
62	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
63	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
64	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
65	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0
66	SR4H757A2 Raptor 1270W NB gla	2467	2.5	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 5 deg
9/06/2019 10:15:16 PM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0018
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0079
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0001	

ObtrusiveLight_1_III_Seg54	**PASS**	0.0001
ObtrusiveLight_1_III_Seg55	**PASS**	0.0000
ObtrusiveLight_1_III_Seg56	**PASS**	0.0000
ObtrusiveLight_1_III_Seg57	**PASS**	0.0000
ObtrusiveLight_1_III_Seg58	**PASS**	0.0008
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0006
ObtrusiveLight_1_III_Seg61	**PASS**	0.0020
ObtrusiveLight_1_III_Seg62	**PASS**	0.0027

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (50)
Test Results: **FAIL**

Failed Luminaire Locations (50):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	2245	5	0	0
37	A2 Midi HST 250 W	2245	5	0	0
38	A2 Midi HST 250 W	2245	5	0	0
39	A2 Midi HST 250 W	2245	5	0	0
40	A2 Midi HST 250 W	2245	5	0	0
41	A2 Midi HST 250 W	2245	5	0	0
42	A2 Midi HST 250 W	2245	5	0	0
43	A2 Midi HST 250 W	2245	5	0	0
44	A2 Midi HST 250 W	2245	5	0	0
45	A2 Midi HST 250 W	2245	5	0	0
46	A2 Midi HST 250 W	2245	5	0	0
47	A2 Midi HST 250 W	2245	5	0	0
48	A2 Midi HST 250 W	2245	5	0	0
49	A2 Midi HST 250 W	2245	5	0	0
50	A2 Midi HST 250 W	2245	5	0	0
1	BLP65 WB 2000W T10 glass flat	932	5	0	0
2	BLP65 WB 2000W T10 glass flat	932	5	0	0
3	BLP65 WB 2000W T10 glass flat	932	5	0	0
4	BLP65 WB 2000W T10 glass flat	932	5	0	0
5	BLP65 WB 2000W T10 glass flat	932	5	0	0
6	BLP65 WB 2000W T10 glass flat	932	5	0	0
7	BLP65 WB 2000W T10 glass flat	932	5	0	0
8	BLP65 WB 2000W T10 glass flat	932	5	0	0
9	BLP65 WB 2000W T10 glass flat	932	5	0	0
10	BLP65 WB 2000W T10 glass flat	932	5	0	0
11	BLP65 WB 2000W T10 glass flat	932	5	0	0
12	BLP65 WB 2000W T10 glass flat	932	5	0	0
13	BLP65 WB 2000W T10 glass flat	932	5	0	0
14	BLP65 WB 2000W T10 glass flat	932	5	0	0
15	BLP65 WB 2000W T10 glass flat	932	5	0	0
16	BLP65 WB 2000W T10 glass flat	932	5	0	0
17	BLP65 WB 2000W T10 glass flat	932	5	0	0
18	BLP65 WB 2000W T10 glass flat	932	5	0	0
19	BLP65 WB 2000W T10 glass flat	932	5	0	0
20	BLP65 WB 2000W T10 glass flat	932	5	0	0
21	BLP65 WB 2000W T10 glass flat	932	5	0	0
22	BLP65 WB 2000W T10 glass flat	932	5	0	0
23	BLP65 WB 2000W T10 glass flat	932	5	0	0
24	BLP65 WB 2000W T10 glass flat	932	5	0	0
25	BLP65 WB 2000W T10 glass flat	932	5	0	0
26	BLP65 WB 2000W T10 glass flat	932	5	0	0
27	BLP65 WB 2000W T10 glass flat	932	5	0	0
28	BLP65 WB 2000W T10 glass flat	932	5	0	0
29	BLP65 WB 2000W T10 glass flat	932	5	0	0

30	BLP65 WB 2000W T10 glass flat	932	5	0	0
31	BLP65 WB 2000W T10 glass flat	932	5	0	0
32	BLP65 WB 2000W T10 glass flat	932	5	0	0
33	BLP65 WB 2000W T10 glass flat	932	5	0	0
34	BLP65 WB 2000W T10 glass flat	932	5	0	0
35	BLP65 WB 2000W T10 glass flat	932	5	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 5 deg A
11/06/2019 9:30:17 AM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		PASS	0.0055
ObtrusiveLight_1_Ill_Seg2		PASS	0.0080
ObtrusiveLight_1_Ill_Seg3		PASS	0.0118
ObtrusiveLight_1_Ill_Seg4		PASS	0.0013
ObtrusiveLight_1_Ill_Seg5		PASS	0.0014
ObtrusiveLight_1_Ill_Seg6		PASS	0.0016
ObtrusiveLight_1_Ill_Seg7		PASS	0.0013
ObtrusiveLight_1_Ill_Seg8		PASS	0.0014
ObtrusiveLight_1_Ill_Seg9		PASS	0.0012
ObtrusiveLight_1_Ill_Seg10	PASS	0.0013	
ObtrusiveLight_1_Ill_Seg11	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg12	PASS	0.0012	
ObtrusiveLight_1_Ill_Seg13	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg14	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg15	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg16	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg17	PASS	0.0009	
ObtrusiveLight_1_Ill_Seg18	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg19	PASS	0.0010	
ObtrusiveLight_1_Ill_Seg20	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg21	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg22	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg23	PASS	0.0009	
ObtrusiveLight_1_Ill_Seg24	PASS	0.0004	
ObtrusiveLight_1_Ill_Seg25	PASS	0.0008	
ObtrusiveLight_1_Ill_Seg26	PASS	0.0007	
ObtrusiveLight_1_Ill_Seg27	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg28	PASS	0.0007	
ObtrusiveLight_1_Ill_Seg29	PASS	0.0019	
ObtrusiveLight_1_Ill_Seg30	PASS	0.0016	
ObtrusiveLight_1_Ill_Seg31	PASS	0.0004	
ObtrusiveLight_1_Ill_Seg32	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg33	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg34	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg35	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg36	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg37	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg38	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg39	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg40	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg41	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg42	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg43	PASS	0.0004	
ObtrusiveLight_1_Ill_Seg44	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg45	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg46	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg47	PASS	0.0004	
ObtrusiveLight_1_Ill_Seg48	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg49	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg50	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg51	PASS	0.0006	
ObtrusiveLight_1_Ill_Seg52	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg53	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg54	PASS	0.0005	
ObtrusiveLight_1_Ill_Seg55	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg56	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg57	PASS	0.0000	

ObtrusiveLight_1_III_Seg58	**PASS**	0.0010
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0006
ObtrusiveLight_1_III_Seg61	**PASS**	0.0026
ObtrusiveLight_1_III_Seg62	**PASS**	0.0115

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **FAIL**

Failed Luminaire Locations (66):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	2245	5	0	0
37	A2 Midi HST 250 W	2245	5	0	0
38	A2 Midi HST 250 W	2245	5	0	0
39	A2 Midi HST 250 W	2245	5	0	0
40	A2 Midi HST 250 W	2245	5	0	0
41	A2 Midi HST 250 W	2245	5	0	0
42	A2 Midi HST 250 W	2245	5	0	0
43	A2 Midi HST 250 W	2245	5	0	0
44	A2 Midi HST 250 W	2245	5	0	0
45	A2 Midi HST 250 W	2245	5	0	0
46	A2 Midi HST 250 W	2245	5	0	0
47	A2 Midi HST 250 W	2245	5	0	0
48	A2 Midi HST 250 W	2245	5	0	0
49	A2 Midi HST 250 W	2245	5	0	0
50	A2 Midi HST 250 W	2245	5	0	0
1	BLP65 WB 2000W T10 glass flat	932	5	0	0
2	BLP65 WB 2000W T10 glass flat	932	5	0	0
3	BLP65 WB 2000W T10 glass flat	932	5	0	0
4	BLP65 WB 2000W T10 glass flat	932	5	0	0
5	BLP65 WB 2000W T10 glass flat	932	5	0	0
6	BLP65 WB 2000W T10 glass flat	932	5	0	0
7	BLP65 WB 2000W T10 glass flat	932	5	0	0
8	BLP65 WB 2000W T10 glass flat	932	5	0	0
9	BLP65 WB 2000W T10 glass flat	932	5	0	0
10	BLP65 WB 2000W T10 glass flat	932	5	0	0
11	BLP65 WB 2000W T10 glass flat	932	5	0	0
12	BLP65 WB 2000W T10 glass flat	932	5	0	0
13	BLP65 WB 2000W T10 glass flat	932	5	0	0
14	BLP65 WB 2000W T10 glass flat	932	5	0	0
15	BLP65 WB 2000W T10 glass flat	932	5	0	0
16	BLP65 WB 2000W T10 glass flat	932	5	0	0
17	BLP65 WB 2000W T10 glass flat	932	5	0	0
18	BLP65 WB 2000W T10 glass flat	932	5	0	0
19	BLP65 WB 2000W T10 glass flat	932	5	0	0
20	BLP65 WB 2000W T10 glass flat	932	5	0	0
21	BLP65 WB 2000W T10 glass flat	932	5	0	0
22	BLP65 WB 2000W T10 glass flat	932	5	0	0
23	BLP65 WB 2000W T10 glass flat	932	5	0	0
24	BLP65 WB 2000W T10 glass flat	932	5	0	0
25	BLP65 WB 2000W T10 glass flat	932	5	0	0
26	BLP65 WB 2000W T10 glass flat	932	5	0	0
27	BLP65 WB 2000W T10 glass flat	932	5	0	0
28	BLP65 WB 2000W T10 glass flat	932	5	0	0
29	BLP65 WB 2000W T10 glass flat	932	5	0	0
30	BLP65 WB 2000W T10 glass flat	932	5	0	0
31	BLP65 WB 2000W T10 glass flat	932	5	0	0
32	BLP65 WB 2000W T10 glass flat	932	5	0	0
33	BLP65 WB 2000W T10 glass flat	932	5	0	0
34	BLP65 WB 2000W T10 glass flat	932	5	0	0
35	BLP65 WB 2000W T10 glass flat	932	5	0	0
51	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
52	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0

53	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
54	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
55	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
56	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
57	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
58	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
59	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
60	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
61	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
62	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
63	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
64	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
65	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
66	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Non-Curfew L1
Filename: L159D Bowens Silver AGI1 190609 5 deg
9/06/2019 10:13:12 PM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0018
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0079
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0001	

ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0001
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg58	**PASS**	0.0008
ObtrusiveLight_1_Ill_Seg59	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg60	**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg61	**PASS**	0.0020
ObtrusiveLight_1_Ill_Seg62	**PASS**	0.0027

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 2500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (50)
Test Results: **PASS**

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Non-Curfew L1
Filename: L159D Bowens Silver AGI1 190609 5 deg A
11/06/2019 9:29:27 AM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0055
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0080
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0118
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0016
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0012
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0013	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0012	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0019	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0016	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000	

ObtrusiveLight_1_Ill_Seg58	**PASS**	0.0010
ObtrusiveLight_1_Ill_Seg59	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg60	**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg61	**PASS**	0.0026
ObtrusiveLight_1_Ill_Seg62	**PASS**	0.0115

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 2500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **FAIL**

Failed Luminaire Locations (16):

Lum.No.	Label	Cd	Tilt	Roll	Spin
51	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
52	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
53	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
54	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
55	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
56	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
57	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
58	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
59	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
60	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
61	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
62	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
63	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
64	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
65	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0
66	SR4H757A2 Raptor 1270W NB gla	3323	5	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 7_5 deg
10/06/2019 1:03:19 PM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0022
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0020
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0099
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0006
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0004
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0003	
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000	

ObtrusiveLight_1_Ill_Seg58	**PASS**	0.0010
ObtrusiveLight_1_Ill_Seg59	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg60	**PASS**	0.0007
ObtrusiveLight_1_Ill_Seg61	**PASS**	0.0023
ObtrusiveLight_1_Ill_Seg62	**PASS**	0.0033

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (50)
Test Results: **FAIL**

Failed Luminaire Locations (50):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	3808	7.5	0	0
37	A2 Midi HST 250 W	3808	7.5	0	0
38	A2 Midi HST 250 W	3808	7.5	0	0
39	A2 Midi HST 250 W	3808	7.5	0	0
40	A2 Midi HST 250 W	3808	7.5	0	0
41	A2 Midi HST 250 W	3808	7.5	0	0
42	A2 Midi HST 250 W	3808	7.5	0	0
43	A2 Midi HST 250 W	3808	7.5	0	0
44	A2 Midi HST 250 W	3808	7.5	0	0
45	A2 Midi HST 250 W	3808	7.5	0	0
46	A2 Midi HST 250 W	3808	7.5	0	0
47	A2 Midi HST 250 W	3808	7.5	0	0
48	A2 Midi HST 250 W	3808	7.5	0	0
49	A2 Midi HST 250 W	3808	7.5	0	0
50	A2 Midi HST 250 W	3808	7.5	0	0
1	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
2	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
3	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
4	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
5	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
6	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
7	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
8	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
9	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
10	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
11	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
12	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
13	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
14	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
15	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
16	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
17	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
18	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
19	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
20	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
21	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
22	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
23	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
24	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
25	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
26	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
27	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
28	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
29	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
30	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
31	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
32	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
33	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
34	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
35	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Curfew
Filename: L159D Bowens Silver AGI1 190609 7_5 deg A
11/06/2019 9:45:15 AM

Illuminance

Maximum Allowable Value: 0.1 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0066
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0095
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0143
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0016
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0013	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0014	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0012	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0027	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0016	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000	

ObtrusiveLight_1_III_Seg58	**PASS**	0.0012
ObtrusiveLight_1_III_Seg59	**PASS**	0.0000
ObtrusiveLight_1_III_Seg60	**PASS**	0.0007
ObtrusiveLight_1_III_Seg61	**PASS**	0.0032
ObtrusiveLight_1_III_Seg62	**PASS**	0.0148

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **FAIL**

Failed Luminaire Locations (66):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	3808	7.5	0	0
37	A2 Midi HST 250 W	3808	7.5	0	0
38	A2 Midi HST 250 W	3808	7.5	0	0
39	A2 Midi HST 250 W	3808	7.5	0	0
40	A2 Midi HST 250 W	3808	7.5	0	0
41	A2 Midi HST 250 W	3808	7.5	0	0
42	A2 Midi HST 250 W	3808	7.5	0	0
43	A2 Midi HST 250 W	3808	7.5	0	0
44	A2 Midi HST 250 W	3808	7.5	0	0
45	A2 Midi HST 250 W	3808	7.5	0	0
46	A2 Midi HST 250 W	3808	7.5	0	0
47	A2 Midi HST 250 W	3808	7.5	0	0
48	A2 Midi HST 250 W	3808	7.5	0	0
49	A2 Midi HST 250 W	3808	7.5	0	0
50	A2 Midi HST 250 W	3808	7.5	0	0
1	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
2	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
3	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
4	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
5	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
6	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
7	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
8	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
9	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
10	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
11	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
12	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
13	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
14	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
15	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
16	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
17	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
18	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
19	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
20	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
21	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
22	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
23	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
24	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
25	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
26	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
27	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
28	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
29	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
30	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
31	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
32	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
33	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
34	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
35	BLP65 WB 2000W T10 glass flat	1141	7.5	0	0
51	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
52	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0

53	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
54	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
55	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
56	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
57	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
58	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
59	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
60	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
61	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
62	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
63	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
64	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
65	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
66	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Non-Curfew L1
Filename: L159D Bowens Silver AGI1 190609 7_5 deg
10/06/2019 1:08:07 PM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		PASS	0.0022
ObtrusiveLight_1_Ill_Seg2		PASS	0.0020
ObtrusiveLight_1_Ill_Seg3		PASS	0.0099
ObtrusiveLight_1_Ill_Seg4		PASS	0.0004
ObtrusiveLight_1_Ill_Seg5		PASS	0.0004
ObtrusiveLight_1_Ill_Seg6		PASS	0.0006
ObtrusiveLight_1_Ill_Seg7		PASS	0.0003
ObtrusiveLight_1_Ill_Seg8		PASS	0.0004
ObtrusiveLight_1_Ill_Seg9		PASS	0.0003
ObtrusiveLight_1_Ill_Seg10	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg11	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg12	PASS	0.0004	
ObtrusiveLight_1_Ill_Seg13	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg14	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg15	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg16	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg17	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg18	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg19	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg20	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg21	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg22	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg23	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg24	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg25	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg26	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg27	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg28	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg29	PASS	0.0011	
ObtrusiveLight_1_Ill_Seg30	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg31	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg32	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg33	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg34	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg35	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg36	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg37	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg38	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg39	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg40	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg41	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg42	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg43	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg44	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg45	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg46	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg47	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg48	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg49	PASS	0.0000	
ObtrusiveLight_1_Ill_Seg50	PASS	0.0003	
ObtrusiveLight_1_Ill_Seg51	PASS	0.0002	
ObtrusiveLight_1_Ill_Seg52	PASS	0.0001	
ObtrusiveLight_1_Ill_Seg53	PASS	0.0002	

ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0003
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg58	**PASS**	0.0010
ObtrusiveLight_1_Ill_Seg59	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg60	**PASS**	0.0007
ObtrusiveLight_1_Ill_Seg61	**PASS**	0.0023
ObtrusiveLight_1_Ill_Seg62	**PASS**	0.0033

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 2500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (50)
Test Results: **FAIL**

Failed Luminaire Locations (15):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	3808	7.5	0	0
37	A2 Midi HST 250 W	3808	7.5	0	0
38	A2 Midi HST 250 W	3808	7.5	0	0
39	A2 Midi HST 250 W	3808	7.5	0	0
40	A2 Midi HST 250 W	3808	7.5	0	0
41	A2 Midi HST 250 W	3808	7.5	0	0
42	A2 Midi HST 250 W	3808	7.5	0	0
43	A2 Midi HST 250 W	3808	7.5	0	0
44	A2 Midi HST 250 W	3808	7.5	0	0
45	A2 Midi HST 250 W	3808	7.5	0	0
46	A2 Midi HST 250 W	3808	7.5	0	0
47	A2 Midi HST 250 W	3808	7.5	0	0
48	A2 Midi HST 250 W	3808	7.5	0	0
49	A2 Midi HST 250 W	3808	7.5	0	0
50	A2 Midi HST 250 W	3808	7.5	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A1 - Dark, Non-Curfew L1
Filename: L159D Bowens Silver AGI1 190609 7_5 deg A
11/06/2019 9:43:38 AM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (62):

Calculation Label	Test Results	Max. Illum.	
ObtrusiveLight_1_Ill_Seg1		**PASS**	0.0066
ObtrusiveLight_1_Ill_Seg2		**PASS**	0.0095
ObtrusiveLight_1_Ill_Seg3		**PASS**	0.0143
ObtrusiveLight_1_Ill_Seg4		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg5		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg6		**PASS**	0.0016
ObtrusiveLight_1_Ill_Seg7		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg8		**PASS**	0.0014
ObtrusiveLight_1_Ill_Seg9		**PASS**	0.0013
ObtrusiveLight_1_Ill_Seg10	**PASS**	0.0013	
ObtrusiveLight_1_Ill_Seg11	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg12	**PASS**	0.0014	
ObtrusiveLight_1_Ill_Seg13	**PASS**	0.0012	
ObtrusiveLight_1_Ill_Seg14	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg15	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg16	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg17	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg18	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg19	**PASS**	0.0011	
ObtrusiveLight_1_Ill_Seg20	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg21	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg22	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg23	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg24	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg25	**PASS**	0.0009	
ObtrusiveLight_1_Ill_Seg26	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg27	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg28	**PASS**	0.0010	
ObtrusiveLight_1_Ill_Seg29	**PASS**	0.0027	
ObtrusiveLight_1_Ill_Seg30	**PASS**	0.0016	
ObtrusiveLight_1_Ill_Seg31	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg32	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg33	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg34	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg35	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg36	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg37	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg38	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg39	**PASS**	0.0004	
ObtrusiveLight_1_Ill_Seg40	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg41	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg42	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg43	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg44	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg45	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg46	**PASS**	0.0002	
ObtrusiveLight_1_Ill_Seg47	**PASS**	0.0005	
ObtrusiveLight_1_Ill_Seg48	**PASS**	0.0006	
ObtrusiveLight_1_Ill_Seg49	**PASS**	0.0001	
ObtrusiveLight_1_Ill_Seg50	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg51	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg52	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg53	**PASS**	0.0007	
ObtrusiveLight_1_Ill_Seg54	**PASS**	0.0008	
ObtrusiveLight_1_Ill_Seg55	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg56	**PASS**	0.0000	
ObtrusiveLight_1_Ill_Seg57	**PASS**	0.0000	

ObtrusiveLight_1_Ill_Seg58	**PASS**	0.0012
ObtrusiveLight_1_Ill_Seg59	**PASS**	0.0000
ObtrusiveLight_1_Ill_Seg60	**PASS**	0.0007
ObtrusiveLight_1_Ill_Seg61	**PASS**	0.0032
ObtrusiveLight_1_Ill_Seg62	**PASS**	0.0148

Luminous Intensity (Cd) Per Luminaire

Maximum Allowable Value: 2500 Cd
Control Angle: 80 Degrees

Luminaire Locations Tested (66)
Test Results: **FAIL**

Failed Luminaire Locations (31):

Lum.No.	Label	Cd	Tilt	Roll	Spin
36	A2 Midi HST 250 W	3808	7.5	0	0
37	A2 Midi HST 250 W	3808	7.5	0	0
38	A2 Midi HST 250 W	3808	7.5	0	0
39	A2 Midi HST 250 W	3808	7.5	0	0
40	A2 Midi HST 250 W	3808	7.5	0	0
41	A2 Midi HST 250 W	3808	7.5	0	0
42	A2 Midi HST 250 W	3808	7.5	0	0
43	A2 Midi HST 250 W	3808	7.5	0	0
44	A2 Midi HST 250 W	3808	7.5	0	0
45	A2 Midi HST 250 W	3808	7.5	0	0
46	A2 Midi HST 250 W	3808	7.5	0	0
47	A2 Midi HST 250 W	3808	7.5	0	0
48	A2 Midi HST 250 W	3808	7.5	0	0
49	A2 Midi HST 250 W	3808	7.5	0	0
50	A2 Midi HST 250 W	3808	7.5	0	0
51	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
52	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
53	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
54	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
55	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
56	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
57	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
58	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
59	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
60	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
61	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
62	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
63	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
64	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
65	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0
66	SR4H757A2 Raptor 1270W NB gla	16120	7.5	0	0

Upward Waste Light Ratio (UWLR)

Maximum Allowable Value: 0.0 %

Calculated UWLR: 0.0 %
Test Results: **PASS**

Annexure D

Correspondence from Siding Spring Observatory

(Total No. of pages including blank pages = 2)

Dear Peter,
Thank you for the clarifying the upward lumens and the colour temperature.

I have made a preliminary calculation of the impact the Bowens Silver Mine project will have on the night sky brightness above SSO. The impact will be negligible.

I plan on refining the calculation over the next couple of weeks. I am not expecting my conclusion to change.

Thank you for your collaboration and interest in keeping the skies above Siding Spring dark.

Regards,

Chris Lidman

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