oOh! Media
Ref: 1308.91

LIGHTING IMPACT ASSESSMENT
EXTERNALLY ILLUMINATED SIGNAGE AT GREAT WESTERN HIGHWAY, HUNTINGWOOD, NSW

DATE	REV	COMMENT	PREPARED BY	CHECKED BY
28/02/24	REV B	For Information	CB	RS

Electrolight Australia
ABN: 44 600 067 392

australia@electrolight.com
www.electrolight.com

4/414 Bourke St
Surry Hills, NSW 2010

T + 61 2 9267 4777

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1. INTRODUCTION

Electrolight have been appointed by oOh! Media on behalf of TfNSW to undertake a Lighting Impact Assessment on the existing double sided externally illuminated signage (**externally illuminated signage**) at Great Western Highway, Huntingwood, NSW. The objective of the assessment is to report on compliance with the State Environmental Planning Policy (Industry and Employment) 2021, NSW Transport Corridor Outdoor Advertising and Signage Guidelines, and AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting.

2. DEFINITIONS

2.1 Illuminance

The physical measure of illumination is illuminance. It is the luminous flux arriving at a surface divided by the area of the illuminated surface. Unit: lux (lx); 1 lx = 1 lm/m2.

(a) Horizontal illuminance (Eh) The value of illuminance on a designated horizontal plane
(b) Vertical illuminance (Ev) The value of illuminance on a designated vertical plane

Where the vertical illuminance is considered in the situation of potentially obtrusive light at a property boundary it can be referred to as environmental vertical illuminance (Eve).

2.2 Luminance

The physical quantity corresponding to the brightness of a surface (e.g. a lamp, luminaire or reflecting material such as the road surface) when viewed from a specified direction. SI Unit: candela per square metre (cd/m2) – also referred to as “nits”.

2.3 Luminous Intensity

The concentration of luminous flux (perceived light power) emitted in a specified direction. Unit: candela (cd).

2.4 Dynamic content

Where the luminous image, pattern, colour or direction of light changes over an interval of less than 60 seconds.

2.5 Obtrusive Light

Spill light which, because of quantitative or directional attributes, gives rise to annoyance, discomfort, distraction, or a reduction in ability to see essential information such as transport signals.
Note: Obtrusive light includes the impact on humans and environmental receivers.

2.6 Threshold Increment

The measure of disability glare expressed as the percentage increase in luminance contrast threshold required between an object and its background for it to be seen equally well with a source of glare present.
Note: The required value is a maximum for compliance of the lighting scheme.

2.7 Environmentally Sensitive Area (ESA)

Area of ecological value including, bushland, waterways and marine and coastal areas.

2.8 AGI32 Light Simulation Software

AGI32 (by U.S. company Lighting Analysts/Revalize) is an industry standard lighting simulation software package that can accurately model and predict the amount of light reaching a designated surface or workplane. AGi32 has been independently tested against the International Commission On Illumination (CIE) benchmark, CIE 171:2006, Test Cases to Assess the Accuracy of Lighting Computer Programs.

2.9 Upward Light Ratio Luminaire (ULR_L)

The ratio of the luminous flux of a luminaire that is emitted, at and above the horizontal, divided by the total luminaire flux when the luminaire is mounted in its designed position, and excluding reflected light from surfaces or obstructions.

2.10 Environmental Receiver

Any identified living species (plants, animals and other organisms) and their locations indicated, that may be impacted by the proposed lighting system.

3. SITE DESCRIPTION AND SCOPE

The existing externally illuminated signage is located at Great Western Highway (near Honeman Close). The signage is comprised of two back-to-back externally illuminated sign faces, Face A and Face B. Face A is oriented towards the westbound traffic approach on Great Western Highway, and Face B is oriented towards the eastbound traffic approach on Great Western Highway. The total active display (illuminated) area of the each sign face is 42.41 m2. Refer to Appendix A for the signage location plan, elevations and photomontages.

Each face of the signage is illuminated using four 20W LED floodlights mounted on a bracket arm located 1.2m above and 1.6m out from the sign. Refer Appendix B for further luminaire specification details. For the purposes of this assessment, it has been assumed that the luminaires are aimed 45 degrees (from vertical) towards the sign face (i.e. directed away from the normal traffic viewing direction). The signage lighting operates all night and is switched off during the day. The signage lighting is not dimmable.

The signage floodlights shall be fitted with custom baffles which mitigate upward waste light, resulting in an Upward Light Ratio (ULR_L) of not more than 0.03*, as stated in AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting - refer Appendix E for details.

Environmental impact assessments, including the management of artificial light for the protection of specific entities protected by environmental legislation, is beyond the scope of this assessment.

*The signage supplier and/or operator is responsible for complying with the Upward Light Ratio. Electrolight take no responsibility for compliance with this requirement.

4. DESIGN GUIDELINES AND STANDARDS

The Lighting Impact Assessment will review the existing signage against the following Criteria, Design Guidelines and Standards.

- State Environmental Planning Policy (Industry and Employment) 2021 (**SEPP Industry and Employment**)
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017 (**Transport Guidelines**)
- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting (**AS4282**)

5. LUMINANCE ASSESSMENT

Face A Assessment

The maximum permissible night time luminance of the externally illuminated signage (Face A) is determined by the existing lighting and land use zoning environment of its surroundings. AS4282 outlines maximum average luminances for different Environmental Zones as shown in Table 1 below:

TABLE 1 - AS4282 MAXIMUM AVERAGE NIGHT TIME LUMINANCE FOR SIGNAGE		
	Description	Max Average Luminance (cd/m2)
A4	High district brightness e.g. Town and city centres and other commercial areas, residential areas abutting commercial areas, industrial and Port areas and Transport Interchanges	350
A3	Medium district brightness e.g. Suburban areas in towns and cities, generally roadways with streetlighting through suburban, rural or semi-rural areas	250
A2	Low district brightness e.g. Sparsely inhabited rural and semi-rural areas, generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections	150
A1	Dark e.g. Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas), generally roadways without streetlighting through rural areas	50
A0	Intrinsically Dark e.g. UNESCO Starlight Reserve, IDA: Dark Sky Parks, Reserves or Sanctuaries, major optical observatories, other accreditations for dark sky places for example astrotourism, heritage value, astronomical importance, wildlife/ecosystem protection, lighting for safe access may be required	0.1

Based on an assessment of the surrounding environment, the proposed signage is located within Environmental Zone A4 under AS4282, therefore, the maximum night time luminance is 350cd/m2.

AS4282 does not include limits for daytime operation of illuminated signage. However, the Transport Guidelines outlines maximum permissible luminance limits for various lighting conditions, including daytime. Under the Transport Guidelines, the existing signage is classified as being within Zone 3, which is described as an area with generally medium off-street ambient lighting e.g. small to medium shopping/ commercial centres. The maximum luminance limits of illuminated signage within Zone 3, with an area over 10m2, is 200cd/m2 (taken to be 25% of the maximum daytime limit of 800cd/m2 as per the recent revision of the Guidelines).

Table 2 below outlines the maximum luminance levels to comply with AS4282 and the Transport Guidelines for the various lighting conditions listed below:

TABLE 2 - LUMINANCE LEVELS FOR EXTERNALLY ILLUMINATED ADVERTISEMENTS FACE A (EASTBOUND)		
Lighting Condition	Max Permissible Luminance (cd/m2)	Compliant
Day	N/A (OFF)	✓
Night Time	200	✓

Photometric data for the luminaires illuminating the sign was provided by the lighting manufacturer* and was used for calculation purposes. The average luminance of Face A of the sign was found to be 39 cd/m2, less than the maximum allowance 200 cd/m2 - refer Appendix D for details. Face A of the signage therefore complies with the luminance limits outlined in AS4282 and the Transport Corridor Outdoor Advertising & Signage Guidelines.

Face B Assessment

The maximum permissible night time luminance of the externally illuminated signage (Face B) is determined by the existing lighting and land use zoning environment of its surroundings. AS4282 outlines maximum average luminances for different Environmental Zones as shown in Table 3 below:

TABLE 3 - AS4282 MAXIMUM AVERAGE NIGHT TIME LUMINANCE FOR SIGNAGE

	Description	Max Average Luminance (cd/m2)
A4	High district brightness e.g. Town and city centres and other commercial areas, residential areas abutting commercial areas, industrial and Port areas and Transport Interchanges	350
A3	Medium district brightness e.g. Suburban areas in towns and cities, generally roadways with streetlighting through suburban, rural or semi-rural areas	250
A2	Low district brightness e.g. Sparsely inhabited rural and semi-rural areas, generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections	150
A1	Dark e.g. Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas), generally roadways without streetlighting through rural areas	50
A0	Intrinsically Dark e.g. UNESCO Starlight Reserve, IDA: Dark Sky Parks, Reserves or Sanctuaries, major optical observatories, other accreditations for dark sky places for example astrotourism, heritage value, astronomical importance, wildlife/ecosystem protection, lighting for safe access may be required	0.1

Based on an assessment of the surrounding environment, the proposed signage is located within Environmental Zone A4 under AS4282, therefore, the maximum night time luminance is 350cd/m2.

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* Electrolight takes no responsibility for the accuracy of third party provided photometric data.

Table 4 below outlines the maximum luminance levels to comply with AS4282 and the Transport Guidelines for the various lighting conditions listed below:

TABLE 4 - LUMINANCE LEVELS FOR EXTERNALLY ILLUMINATED ADVERTISEMENTS FACE B (WESTBOUND)		
Lighting Condition	Max Permissible Luminance (cd/m2)	Compliant
Day	N/A (OFF)	✓
Night Time	200	✓

Photometric data for the luminaires illuminating the sign was provided by the lighting manufacturer* and was used for calculation purposes. The average luminance of Face B of the sign was found to be 38 cd/m2, less than the maximum allowance 200 cd/m2 - refer Appendix D for details. Face B of the signage therefore complies with the luminance limits outlined in AS4282 and the Transport Corridor Outdoor Advertising & Signage Guidelines.

* Electrolight takes no responsibility for the accuracy of third party provided photometric data.

6. AS4282 ASSESSMENT

The externally illuminated signage has been assessed against the lighting criteria and requirements outlined in AS4282.

AS4282 provides limits for different obtrusive factors associated with dark hours (night time) operation of outdoor lighting systems. Two sets of limiting values for spill light are given based on whether the lighting is operating before a curfew (known as "pre-curfew" operation) or operating after a curfew (known as post-curfew or curfewed operation). Pre-curfew spill lighting limits are higher than post-curfew values, on the understanding that spill light is more obtrusive late at night when residents are trying to sleep. Under AS4282, the post-curfew period is taken to be between 11pm and 6am daily. As the signage operates all night, it will be assessed against the more stringent post-curfew limits.

Spill light to any adjacent Environmentally Sensitive Areas are also assessed against the more stringent post-curfew limits, as outlined in Clause 3.2.1 of AS4282.

Illuminance Assessment - Face A & Face B

The AS4282 assessment includes a review of nearby residential dwellings and Environmentally Sensitive Areas and calculation of the amount of vertical illuminance (measured in Lux) that they are likely to receive from the signage during night time operation.

The acceptable level of vertical illuminance will in part be determined by the night time lighting environment around the dwellings. AS4282 categorises the night time environment into different zones with maximum lighting limits as shown in Table 5 below:

TABLE 5 - AS4282 MAXIMUM VALUES OF VERTICAL ILLUMINANCE

	Max Vertical Illuminance (lx)		Description
	Pre-curfew	Post-curfew	
A4	25	5	High district brightness e.g. Town and city centres and other commercial areas, residential areas abutting commercial areas, industrial and Port areas and Transport Interchanges
A3	10	2	Medium district brightness e.g. Suburban areas in towns and cities, generally roadways with streetlighting through suburban, rural or semi-rural areas
A2	5	1	Low district brightness e.g. Sparsely inhabited rural and semi-rural areas, generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections
A1	2	0.1	Dark e.g. Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas), generally roadways without streetlighting through rural areas
A0	0	0	Intrinsically Dark e.g. UNESCO Starlight Reserve, IDA: Dark Sky Parks, Reserves or Sanctuaries, major optical observatories, other accreditations for dark sky places for example astrotourism, heritage value, astronomical importance, wildlife/ecosystem protection, lighting for safe access may be required

Residential Dwellings

As there are no nearby residential dwellings in view of the signage, a Residential Exclusion Zone was calculated in order to demonstrate compliance with AS4282 - refer Appendix D. The Residential Exclusion Zone is defined as the region in which the vertical illuminance levels to residential properties may exceed the maximum allowable under AS4282.

It can be seen that no residential dwellings fall within the exclusion zone. The signage therefore complies with the maximum post-curfew vertical illuminance limits for Zone A4.

Environmentally Sensitive Areas

The following Environmentally Sensitive Area/s with potential views to the sign were also assessed:

Address	Zone
ESA- Honeman Cl	A4

It can be seen from the lighting model that the maximum illuminance to the Environmentally Sensitive Area in Zone A4, Honeman Cl, is 0.19 lux. This illuminance level above complies with the maximum AS4282 limits of 5 lux for Zone A4. There are no Environmentally Sensitive Areas identified in any other zones.

Threshold Increment Assessment

The Threshold Increment was also calculated for the northbound and southbound traffic approaches on Cowpasture Road. The calculation grids were located at 1.5m above ground level, with a viewing distance of between 10m to 200m from the signage and a windscreen cutoff angle of 20 degrees (as outlined in AS1158). The calculation results show that the Threshold Increment does not exceed 1.63% for any traffic approach (the allowable maximum under the standard is 20%).

Upward Waste Light Assesment

In order to reduce light pollution and associated environmental impacts, AS4282 includes requirements that limit upward waste light into the night sky from signage. AS4282 states that externally illuminated signage shall have an Upward Waste Light Ratio (ULR_L) of not more than 0.03. The supplier shall ensure that baffles are installed, as outlined in Appendix E, to meet this requirement.

* Electrolight takes no responsibility for the accuracy of third party provided photometric data.

Luminous Intensity

AS4282 nominates Luminous Intensity limits where a light source (such as a floodlight) can be directly viewed from a residential dwelling or Environmentally Sensitive Area, shown in Table 6 below:

TABLE 6 - MAXIMUM LUMINOUS INTENSITIES PER LUMINAIRE FOR EXTERNALLY ILLUMINATED SIGNAGE			
Environmental Zone	Non-Curfew L1 luminous intensity (cd)	Non-Curfew L2 luminous intensity (cd)	Curfew luminous intensity (cd)
A0	As close to 0 as possible, without impacting safety	As close to 0 as possible, without impacting safety	0
A1	2500	5000	500
A2	7500	12500	1000
A3	12500	25000	2500
A4	25000	50000	2500

It can be seen from the lighting model that the maximum illuminance to the Environmentally Sensitive Area in Zone A4 is 0 cd. The signage therefore complies with the maximum A4 AS4282 luminous intensities limit of 2500 cd for Curfew operation.

AS4282 Assessment Summary

It can therefore be seen that the existing externally illuminated signage complies with all relevant requirements of AS4282.

7. SEPP ASSESSMENT

Table 7 below outlines the illumination assessment criteria from the SEPP Industry and Employment Schedule 5 - Clause 7 Illumination. While the SEPP only applies to sites located on classified roads, this assessment references the guidelines for all sites as a best practice document in New South Wales. In addition to the criteria, responses have been included demonstrating that the existing externally illuminated signage is in compliance.

TABLE 7
7. ILLUMINATION ASSESSMENT CRITERIA

Assessment Criteria	Response	Compliant?
Would illumination result in unacceptable glare?	The existing signage complies with the Threshold Increment limits of AS4282, demonstrating that the illumination will not cause unacceptable glare.	✓
Would illumination affect safety for pedestrians, vehicles or aircraft?	The existing signage complies with the Threshold Increment limits of AS4282, demonstrating that the illumination will not cause unacceptable glare. The floodlights are to be fitted with baffles which limit upward light that is viewable by aircraft.	✓
Would illumination detract from the amenity of any residence or other form of accommodation?	The existing signage, when installed according to this report, complies with the illuminance (spill lighting) limits of AS4282, demonstrating that the illumination will not detract form the amenity of any residence or other form of accommodation	✓
Can the intensity of the illumination be adjusted, if necessary?	The existing signage is not dimmable, however the luminance of the signage is comparatively low for this type of area. Baffles will also be installed to limit the light spill to the surrounding environment.	N/A
Is the illumination subject to a curfew?	The existing advertising signage, when installed according to this report, complies with the limits required during curfewed operation under AS4282 (nominally between the hours of 11pm and 6am). This means that a curfew is not required.	N/A

8. SUMMARY

- The existing signage (Face A) at Great Western Highway, Huntingwood, NSW, shall not exceed the following maximum luminances:

LUMINANCE LEVELS FOR EXTERNALLY ILLUMINATED ADVERTISEMENTS FACE A (EASTBOUND)		
Lighting Condition	Max Permissible Luminance (cd/m2)	Compliant
Day	N/A (OFF)	✓
Night Time	200	✓

- The existing signage (Face B) to be installed at Great Western Highway, Huntingwood, NSW, shall not exceed the following maximum luminances:

LUMINANCE LEVELS FOR EXTERNALLY ILLUMINATED ADVERTISEMENTS FACE B (WESTBOUND)		
Lighting Condition	Max Permissible Luminance (cd/m2)	Compliant
Day	N/A (OFF)	✓
Night Time	200	✓

- The signage shall be fitted with baffles as shown in Appendix E in order to comply with the requirements outlined in this assessment.
- The existing externally illuminated signage has been found to comply with all relevant requirements of AS4282, the Transport Guidelines and SEPP Industry and Employment.
- In complying with the above requirements, the existing signage shall not result in unacceptable glare nor shall it adversely impact the safety of pedestrians, residents or vehicular traffic. Additionally, the signage shall not cause any unacceptable amenity impacts to nearby residential dwellings or accommodation or environmental receivers.

9. DESIGN CERTIFICATION

The existing externally illuminated signage at Great Western Highway, Huntingwood, NSW, if commissioned according to this report, complies with the following criteria, guidelines and standards:

- State Environmental Planning Policy (Industry and Employment) 2021
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017
- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting

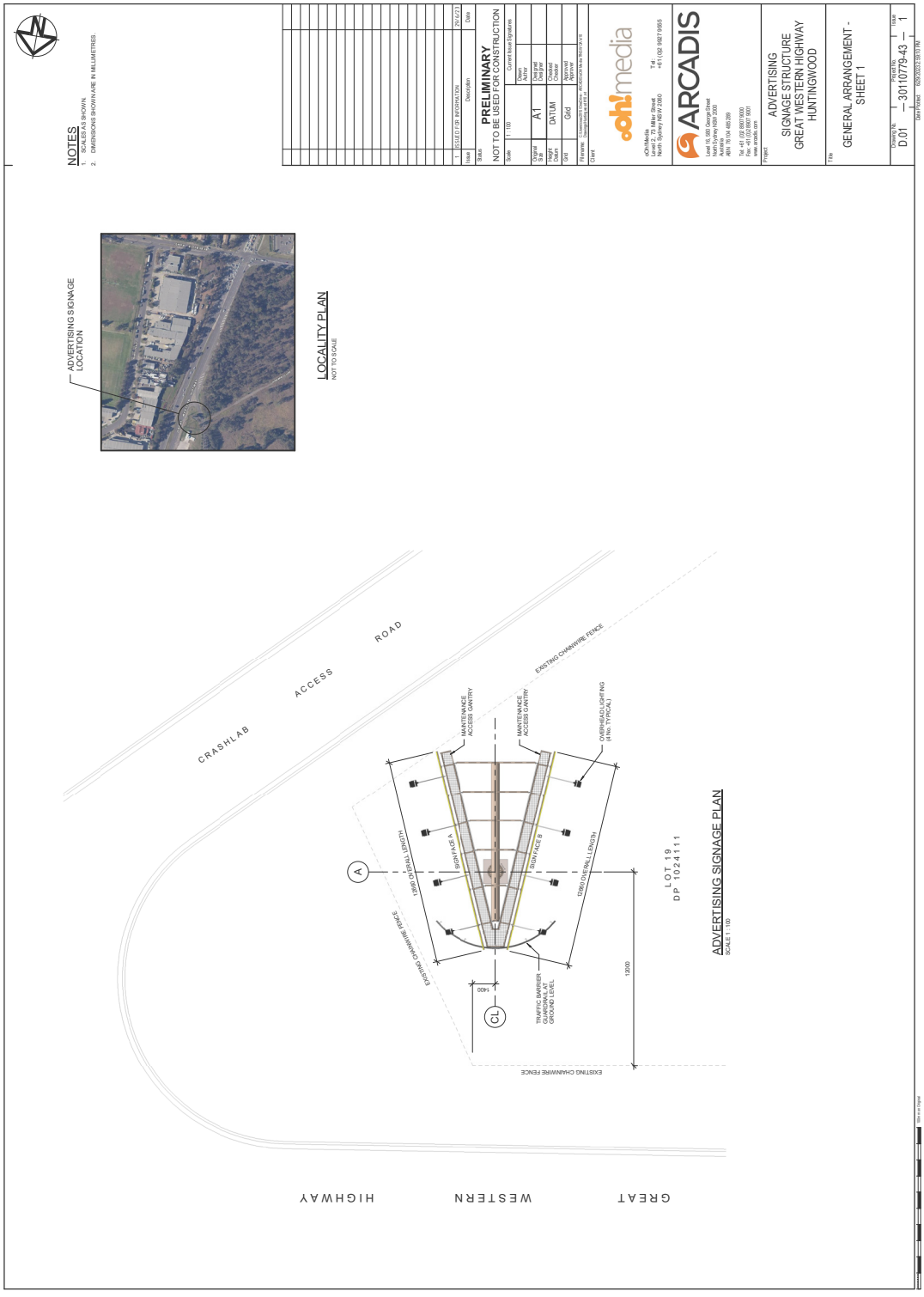
Ryan Shamier MIES

M.Des.Sc(Illumination) B.Eng (Elec)
Member of the Illuminating Engineering Society of Australia and New Zealand (MIES)
Registered Professional Engineer - New South Wales (PRE0000868)

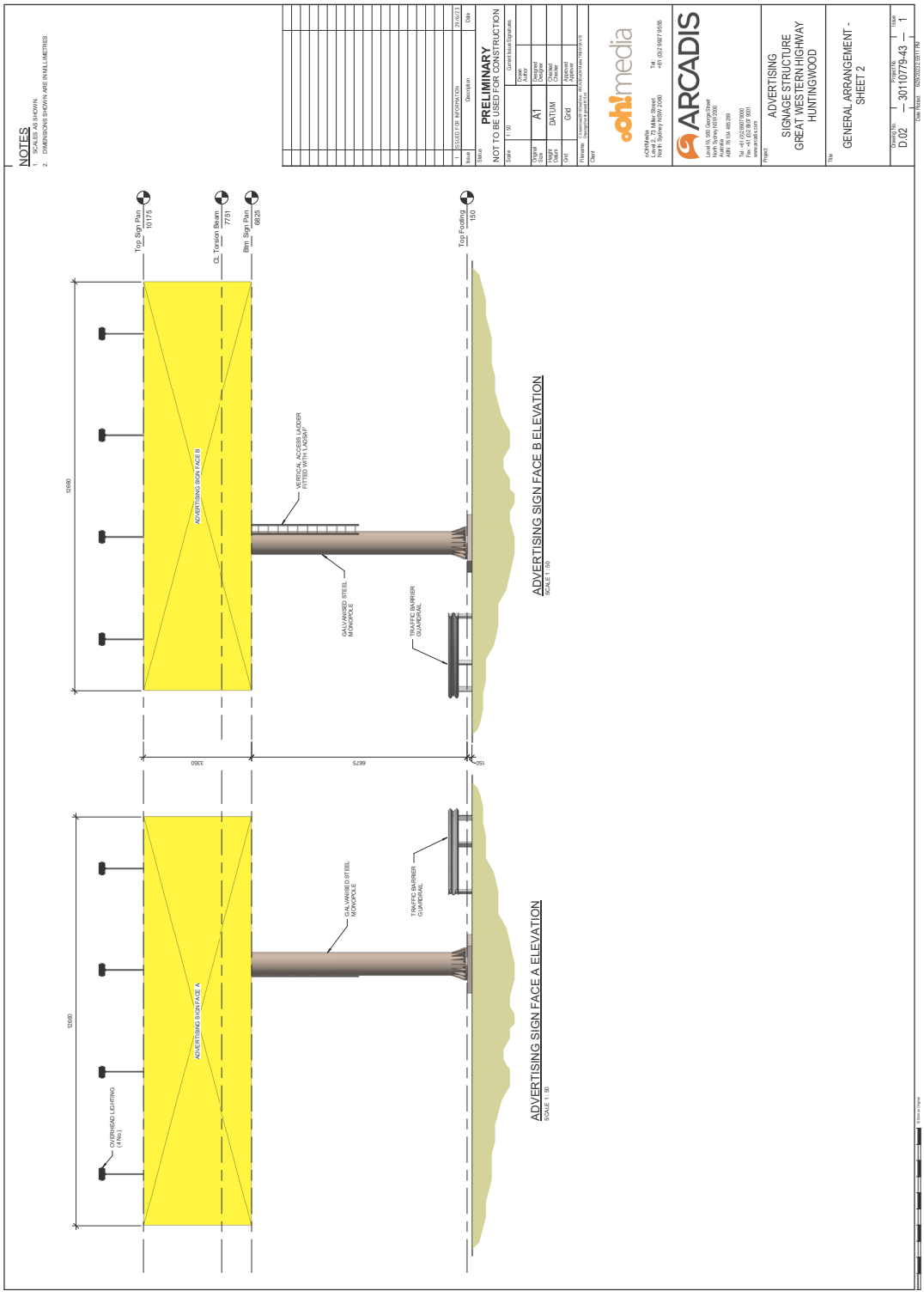
Senior Lighting Designer
Electrolight Sydney
28/02/24

APPENDIX A

PROPOSED SIGNAGE LOCATION, ELEVATIONS & PHOTOMONTAGES



APPENDIX A
PROPOSED SIGNAGE LOCATION, ELEVATIONS & PHOTOMONTAGES



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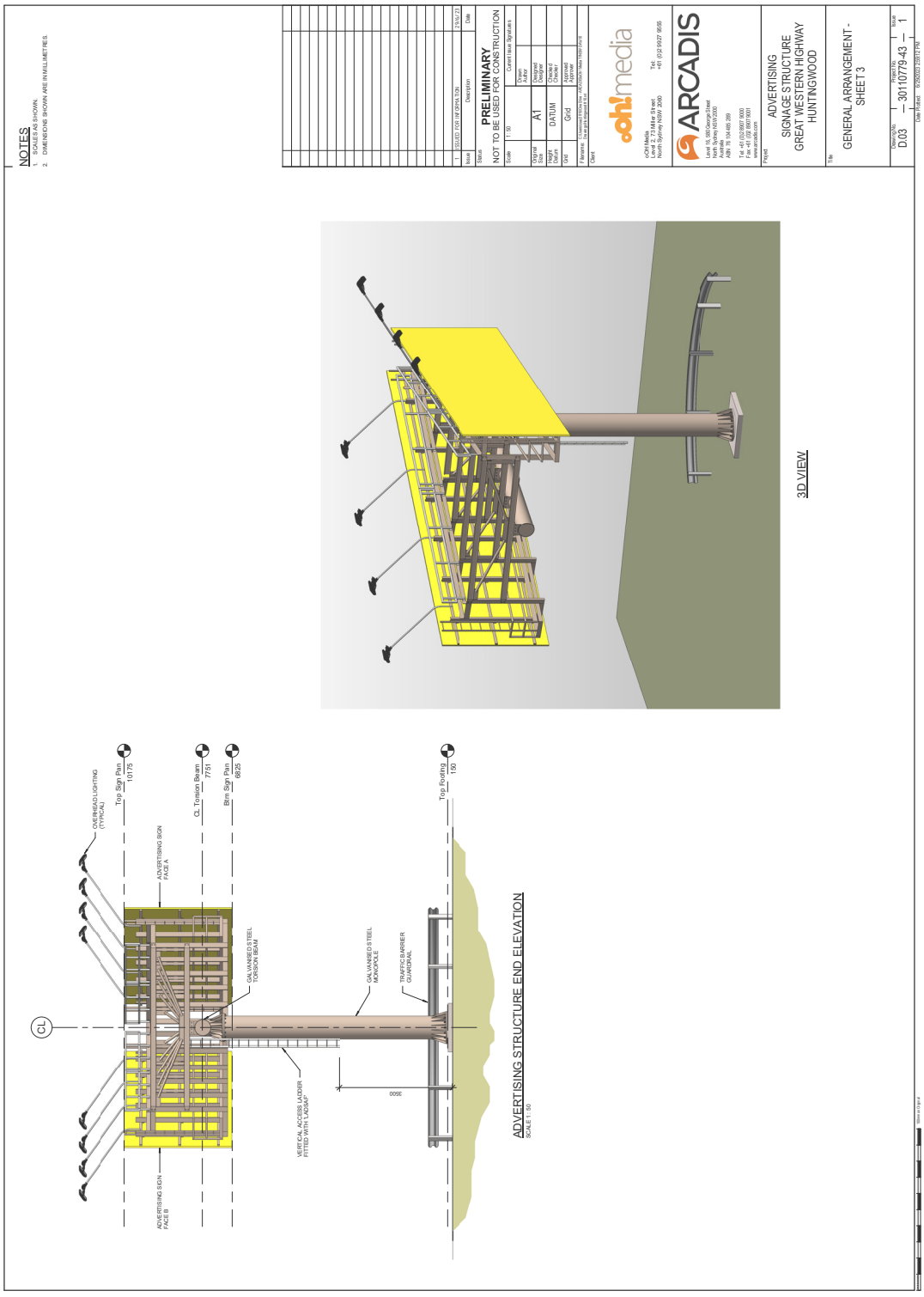


APPENDIX A
PROPOSED SIGNAGE LOCATION, ELEVATIONS & PHOTOMONTAGES

APPENDIX A
PROPOSED SIGNAGE LOCATION, ELEVATIONS & PHOTOMONTAGES

APPENDIX B
DIGITAL SIGNAGE SPECIFICATION

VIBE LIGHTING
quality · innovation · value

LV LED Floodlights

VBLFL-823-4-40

Vibe Low voltage LED floodlights are useful for lighting up the great outdoors as well as other domestic or recreational pursuits. Strong & weatherproof come with a lifetime of 50,000 hours & 3 year warranty.

Features & Benefits

- Powder coated die-cast Aluminium construction with tempered clear glass front
- Equipped with energy efficient SEOUL SMD LED Chips
- Black trim
- Ideal for use in caravans, trucks & boats etc.
- IP65 rated
- 50,000 hour lifespan
- 3 year warranty

www.vibelighting.com.au

APPENDIX C

State Environmental Planning Policy (Industry and Employment) 2021

Schedule 5 Assessment criteria

(Clauses 8, 13 and 17)

1. Character of the area

- Is the proposal compatible with the existing or desired future character of the area or locality in which it is proposed to be located?
- Is the proposal consistent with a particular theme for outdoor advertising in the area or locality?

2. Special areas

- Does the proposal detract from the amenity or visual quality of any environmentally sensitive areas, heritage areas, natural or other conservation areas, open space areas, waterways, rural landscapes or residential areas?

3. Views and vistas

- Does the proposal obscure or compromise important views?
- Does the proposal dominate the skyline and reduce the quality of vistas?
- Does the proposal respect the viewing rights of other advertisers?
-

4. Streetscape, setting or landscape

- Is the scale, proportion and form of the proposal appropriate for the streetscape, setting or landscape?
- Does the proposal contribute to the visual interest of the streetscape, setting or landscape?
- Does the proposal reduce clutter by rationalising and simplifying existing advertising?
- Does the proposal screen unsightliness?
- Does the proposal protrude above buildings, structures or tree canopies in the area or locality?
- Does the proposal require ongoing vegetation management?

5. Site and building

- Is the proposal compatible with the scale, proportion and other characteristics of the site or building, or both, on which the proposed signage is to be located?
- Does the proposal respect important features of the site or building, or both?
- Does the proposal show innovation and imagination in its relationship to the site or building, or both?

6. Associated devices and logos with advertisements and advertising structures

- Have any safety devices, platforms, lighting devices or logos been designed as an integral part of the signage or structure on which it is to be displayed?

7. Illumination

- Would illumination result in unacceptable glare?
- Would illumination affect safety for pedestrians, vehicles or aircraft?
- Would illumination detract from the amenity of any residence or other form of accommodation?
- Can the intensity of the illumination be adjusted, if necessary?
- Is the illumination subject to a curfew?

8. Safety

- Would the proposal reduce the safety for any public road?
- Would the proposal reduce the safety for pedestrians or bicyclists?
- Would the proposal reduce the safety for pedestrians, particularly children, by obscuring sightlines from public areas?

APPENDIX D
OBTRUSIVE LIGHT AND THRESHOLD INCREMENT CALCULATIONS

Calculation Summary			
Project: Ti Direct light from floodlights			
Label	CalcType	Units	Max
Great Western Highway (E)	Obtrusive - TI	%	0.00
Great Western Highway (W)_1	Obtrusive - TI	%	0.01
Great Western Highway (W)	Obtrusive - TI	%	0.00

Calculation Summary			
Project: TI Reflected Off Signage			
Label	CalcType	Units	Max
Great Western Highway (E)	Obtrusive - TI	%	0.06
Great Western Highway (W)_1	Obtrusive - TI	%	1.62
Great Western Highway (W)	Obtrusive - TI	%	0.17

Calculation Summary			
Project: ESA: Honeman Cl			
Label	CalcType	Units	Max
ESA Honeman Cl_Cd_Seg1	Obtrusive - Cd	N.A.	0
ESA Honeman Cl_Ill_Seg1	Obtrusive - Ill	Lux	0.19

Image: Light Model - Plan showing residential exclusion zone.

"Residential Exclusion Zone" is defined as the region in which the illuminance levels to residential properties would exceed the maximum allowable under the Zone limits in AS4282. If no residential properties are located within the Exclusion Zone then the signage will comply with the illuminance limits in the Standard.

The Zone limit shown is for A4 (5 lux maximum).

APPENDIX D
OBTRUSIVE AND THRESHOLD INCREMENT CALCULATIONS

Zone A4 - High District Brightness, Curfew

Filename: 1308.91 Great Western Highway Huntingwood - Rev B - surface illuminance direct light for ESA
28/02/2024 6:05:42 PM

Illuminance
Maximum Allowable Value: 5 Lux

Calculations Tested (1):

Calculation Label	Test Results	Max. Illum.
ESA Honeman Cl_Ill_Seg1	**PASS**	0.19

Luminous Intensity (Cd) At Vertical Planes
Maximum Allowable Value: 2500 Cd

Calculations Tested (1):

Calculation Label	Test Results
ESA Honeman Cl_Cd_Seg1	**PASS**

Zone A4 - High District Brightness, Curfew

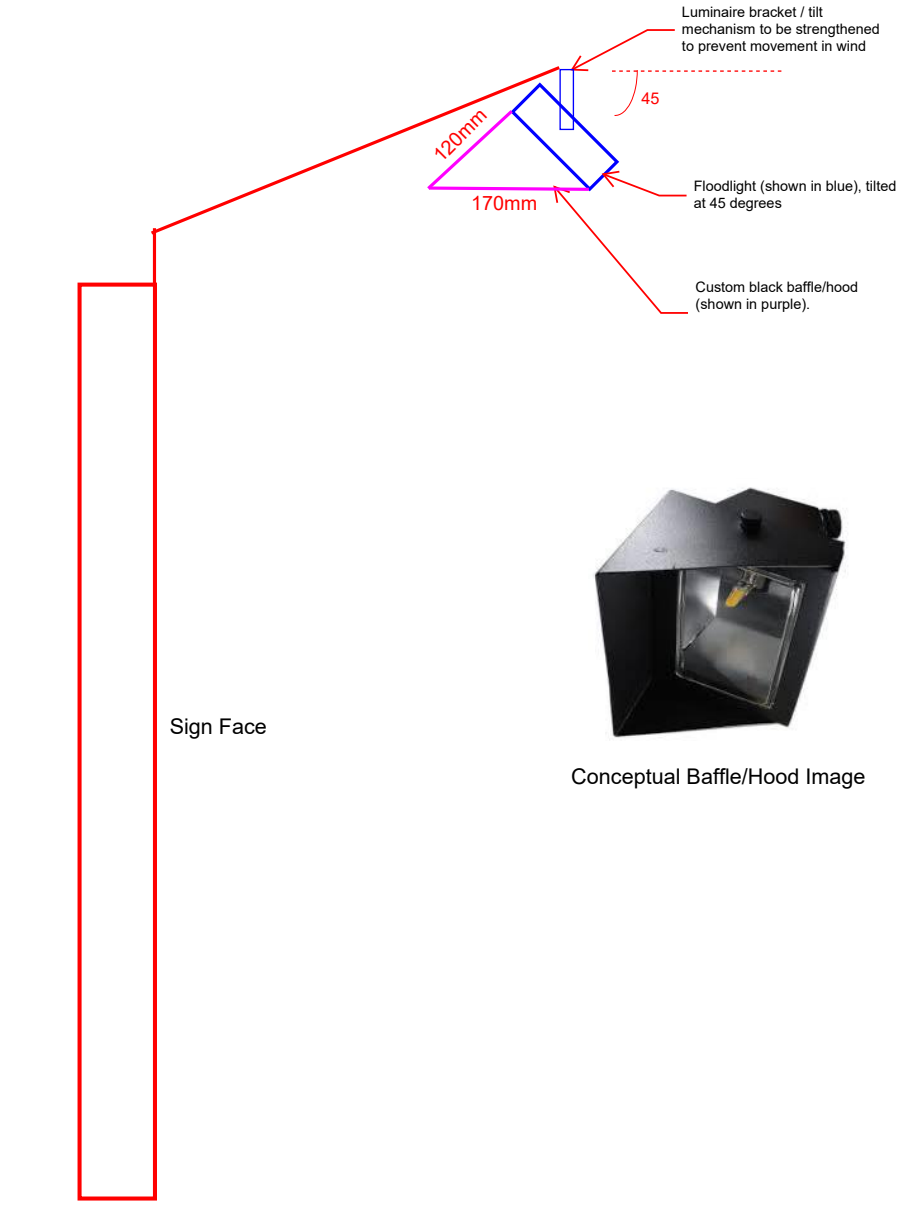
Filename: 1308.91 Great Western Highway Huntingwood - Rev B - TI Screen sim direct light
28/02/2024 5:23:48 PM

Threshold Increment (TI)
Maximum Allowable Value: 20 %

Calculations Tested (3):

Calculation Label	Adaptation Luminance	Test Results
Great Western Highway (W)	5	**PASS**
Great Western Highway (E)	5	**PASS**
Great Western Highway (W)_1	5	**PASS**

APPENDIX E
LUMINAIRE BAFFLE DESIGN



Typical Signage Section

Conceptual Baffle/Hood Image

1308.91 - Indicative Floodlight Baffle Design
Electrolight RS 28/02/24