

JCDecaux

LIGHTING IMPACT ASSESSMENT - OUTDOOR SIGNAGE AT  
M4 HOMEBUSH BAY DR OVERPASS, HOMEBUSH, NSW

30th May 2023  
Ref: 1096.133

Lighting Impact Assessment  
Outdoor Signage at  
M4 Homebush Bay Dr Overpass, Homebush, NSW

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## 1. INTRODUCTION

Electrolight have been appointed by JCDecaux to undertake a Lighting Impact Assessment on the proposed permit extension of the existing internally illuminated signage on the M4 Homebush Bay Dr Overpass, Homebush, 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/m<sup>2</sup>.

(a) Horizontal illuminance (E<sub>h</sub>) The value of illuminance on a designated horizontal plane

(b) Vertical illuminance (E<sub>v</sub>) 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 is referred to as environmental vertical illuminance (E<sub>ve</sub>).

### 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/m<sup>2</sup>) – also referred to as “nits”.

### 2.3 Luminous Intensity

The concentration of luminous flux 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 1 to entry: 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) 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 maybe impacted by the proposed lighting system.

## 2.11 Residential Exclusion Zone

The region in which the illuminance levels to residential properties would exceed the maximum allowable under the Zone limits in AS4282. If not residential properties are located within the Exclusion Zone then the signage will comply with the illuminance limits in the Standard.

# 3. SITE DESCRIPTION AND SCOPE

The existing signage is located on the Homebush Bay Dr Overpass Homebush, NSW. The signage is oriented towards the outbound direction of traffic on Western Motorway (M4). The total active display (illuminated) area of the signage is 42.41 m<sup>2</sup>. Refer to Appendix A for the signage location plan, elevations and photomontages.

The existing signage is comprised of an internally illuminated "light box". The existing lighting inside the signage has reached the end of its usable life and is currently non-operational. The lighting shall be replaced (like for like) with new dimmable LED luminaires that are commissioned such that the signage luminance does not exceed the value shown in Table 2 of Section 5 of this report. The signage has an Upward Light Ratio ( $ULR_L$ ) of not more than 0.50. The signage will be in operation all night and be switched off during the day. The signage is static and does not include dynamic content.

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.

# 4. DESIGN GUIDELINES AND STANDARDS

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

- State Environmental Planning Policy (Industry and Employment) 2021 (Refer Appendix C) (**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

The maximum permissible night time luminance of the signage is determined by the existing lighting environment of its surroundings. AS4282 outlines maximum average luminances for different Environmental Zones as shown in Table 1 below:

TABLE 1 - 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 existing 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 night time luminance of internally illuminated signage within Zone 3 with an area over 10m2 is 200cd/m2 (taken to be 25% of the daytime limit as outlined in the previous revision of the Guidelines). The luminance limits for operation of the signage during the daytime are not applicable as the signage is switched off during the day.

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

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

6. ILLUMINANCE, THRESHOLD INCREMENT & UPWARD LIGHT ASSESSMENT

The existing 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, the signage will be assessed against the more stringent post-curfew limits.

Illuminance Assessment

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

The acceptable level of 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 3 below:

TABLE 3 - MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS			
	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

The existing signage (and surrounding environment) was modeled in lighting calculation program AGI32 to determine the effect (if any) of the light spill from the signage. Photometric data for the signage was based on a diffused light panel (approximating a lambertian emitter) with the maximum luminance corresponding to the night time limit outlined in Section 5. Appendix C shows the lighting model and the results of the calculations. It can be seen that no residential developments fall within the residential exclusion zone. The signage therefore complies with the maximum vertical illuminance limit of 5 lux for Zone A4 post-curfew operation as outlined in Table 3 above.

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

Address	Zone
ESA - Adjacent to Homebush Bay Dr and Western Motorway (M4)	A4

It can be seen from the lighting model that the maximum illuminance to the Environmentally Sensitive Areas is 0.56 lux. This illuminance level above complies with the maximum AS4282 limits of 5 lux for Zone A4.

#### Threshold Increment Assessment

The Threshold Increment was also calculated for the westbound traffic approaches on Western Highway (M4), the onramp from Homebush Bay Dr to Western Highway (M4) westbound, and the exit ramp from Western Highway (M4) to Homebush Bay Dr. 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 16.25% for any traffic approach (the allowable maximum under the standard is 20%).

#### Upward Waste Light Assessment

In order to reduce light pollution and associated environmental impacts, AS4282 includes requirements that limit upward waste light into the night sky from signage. Clause 3.3.3.a) of AS4282 states that internally illuminated signage and other internally illuminated objects shall have an Upward Waste Light Ratio ( $ULR_L$ ) of not more than 0.50. The  $ULR_L$  of the specified signage is not more than 0.50. The signage therefore complies with this requirement.

#### Luminous Intensity

The luminous intensity limits nominated in the standard are not applicable for internally illuminated signage.

#### Summary

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

## 7. SEPP ASSESSMENT

Table 5 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, our assessment references the guidelines as a best practice document in NSW. In addition to the criteria, responses have been included demonstrating that the existing signage is in compliance.

TABLE 5 7. ILLUMINATION ASSESSMENT CRITERIA		
Assessment Criteria	Response	Compliant?
Would illumination result in unacceptable glare?	The proposed 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 proposed signage complies with the Threshold Increment limits of AS4282, demonstrating that the illumination will not cause unacceptable glare.	✓
Would illumination detract from the amenity of any residence or other form of accommodation?	The proposed signage, when installed according to this report, complies with the illuminance (spill lighting) limits of AS4282, demonstrating that the illumination will not detract from the amenity of any residence or other form of accommodation	✓
Can the intensity of the illumination be adjusted, if necessary?	The LED lights are dimmable and can be adjusted if necessary.	✓
Is the illumination subject to a curfew?	The proposed 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 internally illuminated signage on the M4 Homebush Bay Dr Overpass Homebush, NSW shall operate at the following maximum luminances:

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

- The existing internally 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 internally illuminated 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.

## 9. DESIGN CERTIFICATION

The internally illuminated signage on the M4 Homebush Bay Dr Overpass, Homebush, 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



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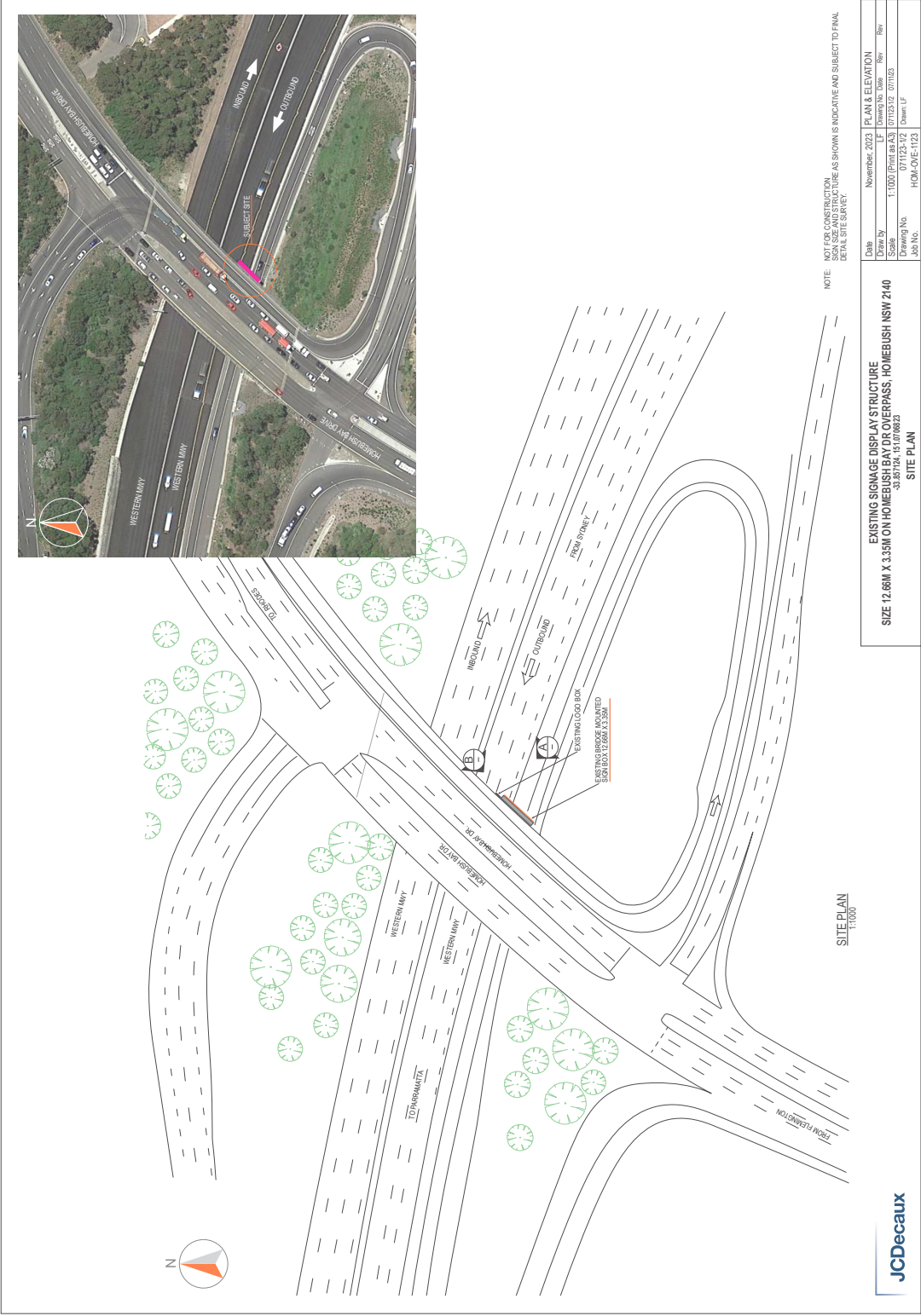
Senior Lighting Designer

Electrolight Sydney

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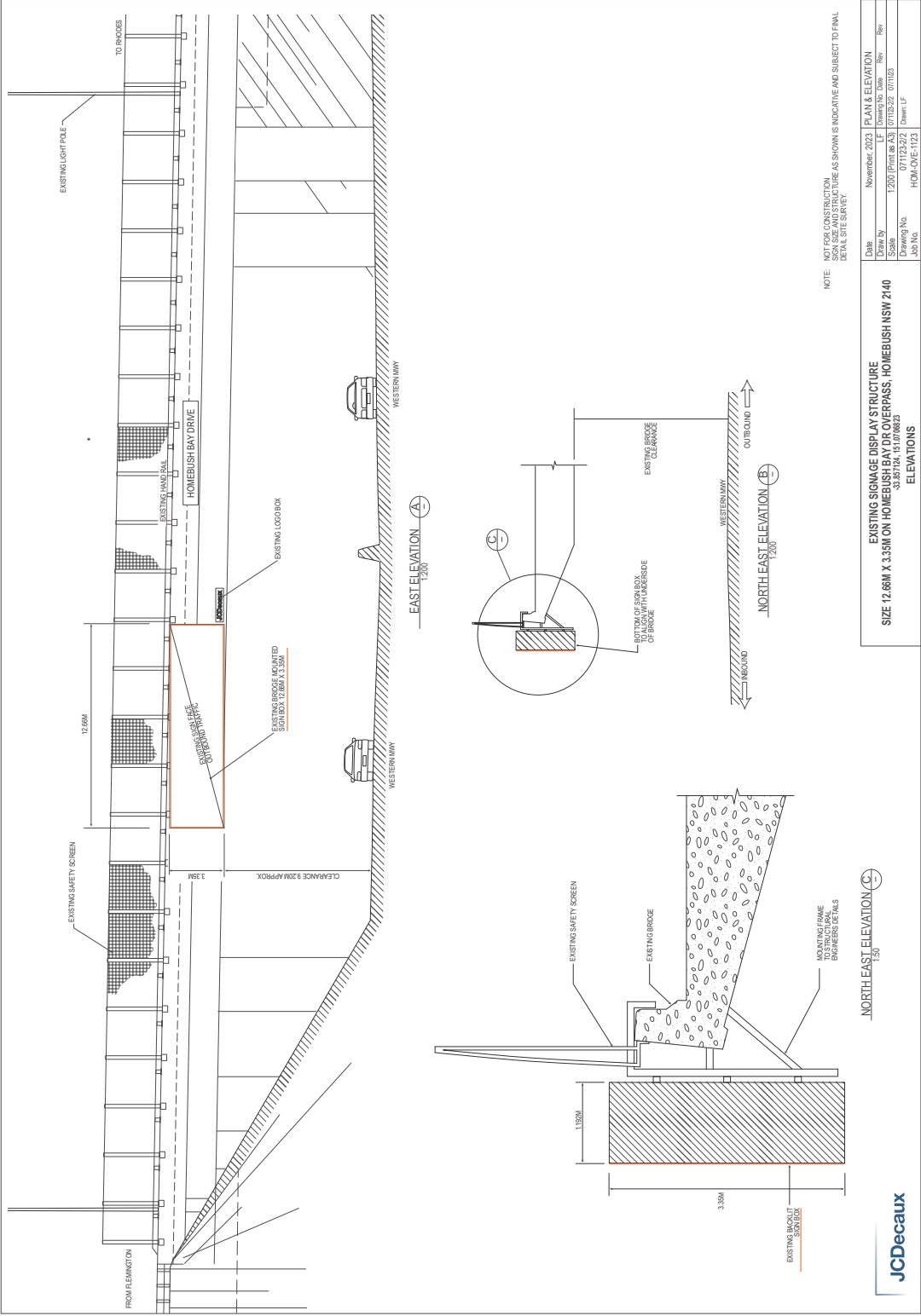
APPENDIX A

EXISTING SIGNAGE LOCATION, ELEVATIONS AND PHOTOMONTAGES



APPENDIX A

EXISTING SIGNAGE LOCATION, ELEVATIONS AND PHOTOMONTAGES



## APPENDIX A

### EXISTING SIGNAGE LOCATION, ELEVATIONS AND PHOTOMONTAGES





## APPENDIX B

# 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?

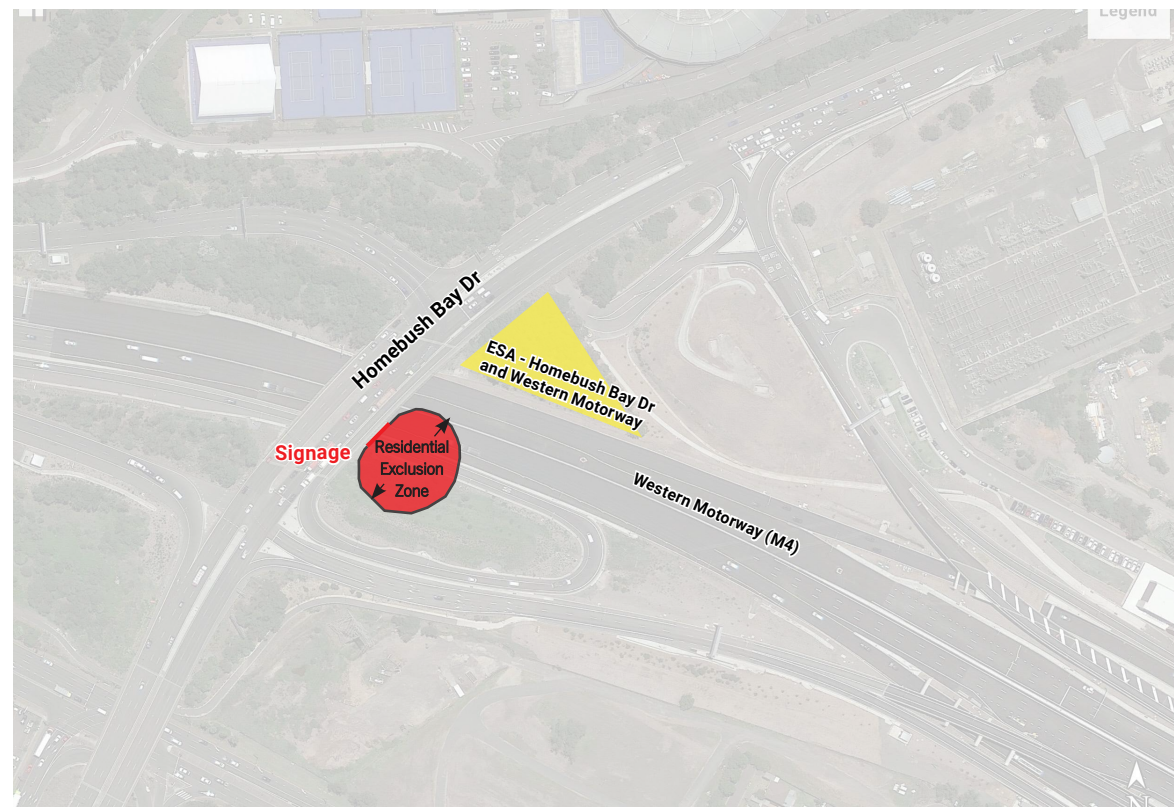
## **8. Safety**

- 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 C

OBTRUSIVE AND THRESHOLD INCREMENT LIGHTING CALCULATIONS

Calculation Summary			
Project: Obtrusive Light			
Label	CalcType	Units	Max
ESA- M4 and Homebush Bay Dr_Ill_Seg1	Obtrusive - Ill	Lux	0.00
ESA- M4 and Homebush Bay Dr_Ill_Seg2	Obtrusive - Ill	Lux	0.56



“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 not residential properties are located within the Exclusion Zone then the signage will comply with the illuminance limits in the Standard.

The Zone 4 limit shown is for A4 (5 lux maximum).

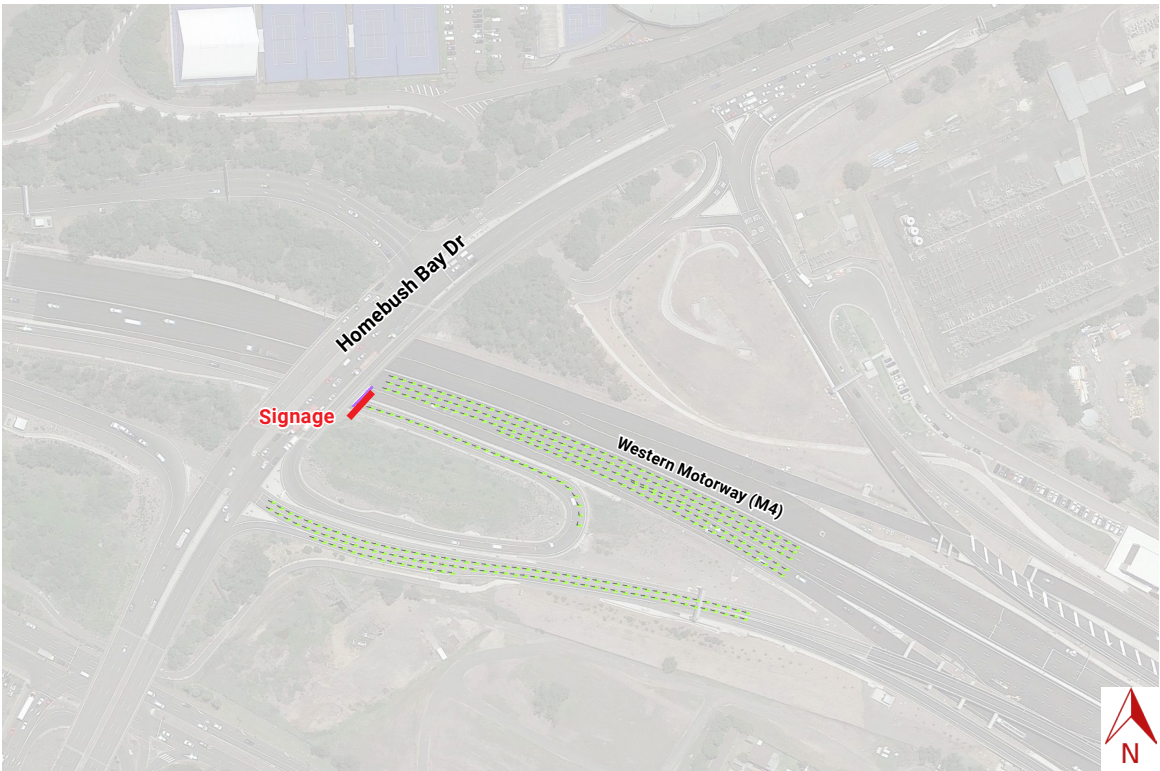




APPENDIX C

OBTRUSIVE AND THRESHOLD INCREMENT CALCULATIONS

Calculation Summary			
Project: TI			
Label	CalcType	Units	Max
Western Hwy Exit Ramp W	Obtrusive - TI	%	0.17
Western Hwy Onramp W	Obtrusive - TI	%	16.25
Western Hwy Westbound	Obtrusive - TI	%	3.04
Western Hwy Westbound 1	Obtrusive - TI	%	2.70



APPENDIX C

OBTRUSIVE LIGHTING AND THRESHOLD INCREMENT CALCULATIONS

Zone A4 - High District Brightness, Curfew  
Filename: 1096.133 M4 Homebush Dr Overpass rev A.AGI  
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**Illuminance**  
Maximum Allowable Value: 5 Lux

Calculations Tested (2):

Calculation Label	Test Results	Max. Illum.
ESA- M4 and Homebush Bay Dr_III_Seg1	PASS	0.00
ESA- M4 and Homebush Bay Dr_III_Seg2	PASS	0.56

**Threshold Increment (TI)**  
Maximum Allowable Value: 20 %

Calculations Tested (4):

Calculation Label	Adaptation Luminance	Test Results
Western Hwy Onramp W	5	PASS
Western Hwy Exit Ramp W	5	PASS
Western Hwy Westbound	5	PASS
Western Hwy Westbound_1	5	PASS