

Transport for NSW
Ref: 3724.5

LIGHTING IMPACT ASSESSMENT
INTERNALLY ILLUMINATED SIGNAGE AT
WARRINGAH RD PEDESTRIAN OVERPASS, FORESTVILLE

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1. INTRODUCTION

Electrolight have been appointed by Transport for NSW to undertake a Lighting Impact Assessment on the proposed permit extension of the existing internally illuminated signage on the Warringah Rd pedestrian overpass, Forestville, NSW. The objective of the assessment is to outline the requirements necessary for 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.

This report outlines the operational requirements needed to comply with the guidelines and standards outlined above. It does not confirm compliance with these standards. Compliance must be determined by site specific luminance measurements of the existing signage.

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 (E_h) The value of illuminance on a designated horizontal plane
- (b) Vertical illuminance (E_v) 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 (E_{ve}).

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.

Note: Definition source is AS4282.

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.

Note: Definition source is AS4282.

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.

Note: Definition source is AS4282.

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.

Note: Definition source is AS4282.

3. SITE DESCRIPTION AND SCOPE

The existing signage is located on the Warringah Rd pedestrian overpass, Forestville and is oriented towards the eastbound direction of traffic on Warringah Rd. The total illuminated area of the signage is 27 m². Refer to Appendix A for the signage location plan and elevations.

The existing signage is comprised of an internally illuminated "light box". The existing lighting inside the signage shall be retained, unless required to be modified to comply with this assessment. Modifications could include installing dimmers and/or new lower output lighting, in order to reduce the luminance of the signage and satisfy the more stringent requirements outlined in the latest standards and guidelines (refer Section 4). If the signage lighting is modified in any way, the resulting luminance of the signage shall not be more than the existing luminance.

The signage lighting will be in operation all night and be switched off during the day. The signage has an Upward Light Ratio (ULR_L) of not more than 0.50. 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 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

The maximum permissible night time luminance of the existing signage 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 existing signage is located within Environmental Zone A3 under AS4282, therefore, the maximum night time luminance is 250cd/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 4, which is described as an area with generally low off-street ambient lighting e.g. most rural areas, or areas that have residential properties nearby. The maximum night time luminance of internally illuminated signage within Zone 4 with an area over 10m2 is 100cd/m2 (taken to be 25% of the daytime limit of 400cd/m2 as outlined in the previous revision of the Transport 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 level 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	90*	✓

*The maximum permissible night time luminance allowable under the Transport Guidelines and AS4282 is actually 100cd/m2. The luminance limit shown above was derived as a result of the calculation and assessment in Section 6, to ensure compliance with other criteria of AS4282 and any additional lighting requirements as described in this report.

6. AS4282 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 existing 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

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 (when the signage is operated in accordance with this report).

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 3 below:

TABLE 3 - 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

Based on an assessment of the surrounding area, the nearest dwellings with potential views to the signage are at the following locations:

Address	Zone	Address	Zone
684 Warringah Rd	A3	785 Warringah Rd	A3
686 Warringah Rd	A3	791 Warringah Rd	A3
688 Warringah Rd	A3	9 Aldinga PI (1)	A3
779 Warringah Rd	A3	9 Aldinga PI (2)	A3
781 Warringah Rd	A3	9 Aldinga PI (3)	A4
783 Warringah Rd	A3		

As such, the dwellings above will form the focus of the illuminance assessment.

The signage (and surrounding environment) was modeled in lighting calculation program AGI32 to determine the effect (if any) of the light spill from the existing 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 B shows the lighting model and the results of the calculations.

Under AS4282, the maximum allowable vertical illuminance to dwellings is 5 lux for Zone A4 and 2 lux for Zone A3 (as outlined in Table 3). It can be seen from the lighting model that the maximum illuminance for Zone A4 properties is 0.11 lux at 9 Aldinga PI (3), and the maximum illuminance for Zone A3 properties is 1.87 lux at 781 Warringah Rd.

The existing signage therefore complies with the relevant illuminance limit for nearby residential dwellings when operated at the maximum luminance level shown in Table 2 of Section 5.

Environmentally Sensitive Areas

No Environmentally Sensitive Areas were identified in the vicinity of the existing signage. The limits in AS4282 therefore do not apply.

Threshold Increment Assessment

The Threshold Increment was also calculated for the eastbound traffic approach on Warringah Rd. 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 2.70% for any traffic approach (the allowable maximum under the standard is 20%). The existing signage therefore complies with the Threshold Increment requirement when it is operated at the maximum luminance level shown in Table 2 of Section 5.

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.

AS4282 Assessment Summary

It can therefore be seen that the existing signage, when operated at the maximum luminance level shown in Table 2 of Section 5, complies with all relevant requirements of AS4282.

Note : Luminance measurements on site are required to confirm that the existing signage luminance does not exceed the maximum luminance level shown in Table 2 of Section 5 of this report.

7. SEPP ASSESSMENT

Table 4 below outlines the illumination assessment criteria from the SEPP Industry and Employment Schedule 5 - Clause 7 Illumination. Responses have been included demonstrating that the existing signage will comply when operated at the maximum luminance level shown in Table 2 of Section 5.

TABLE 4 - 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 relatively low intensity limits the risk to pedestrians, vehicles or 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 from 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 lighting within the signage can be modified as necessary to meet the requirements of this assessment. This may include installing of dimmers or new lower intensity lighting.	✓ (if required)
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 at the pedestrian overpass over Warringah Rd, Forestville shall be modified as necessary to not exceed 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	90	✓

- When the existing signage is operated in accordance with the above, the existing signage will 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 signage at the pedestrian overpass over Warringah Rd, Forestville, if operated 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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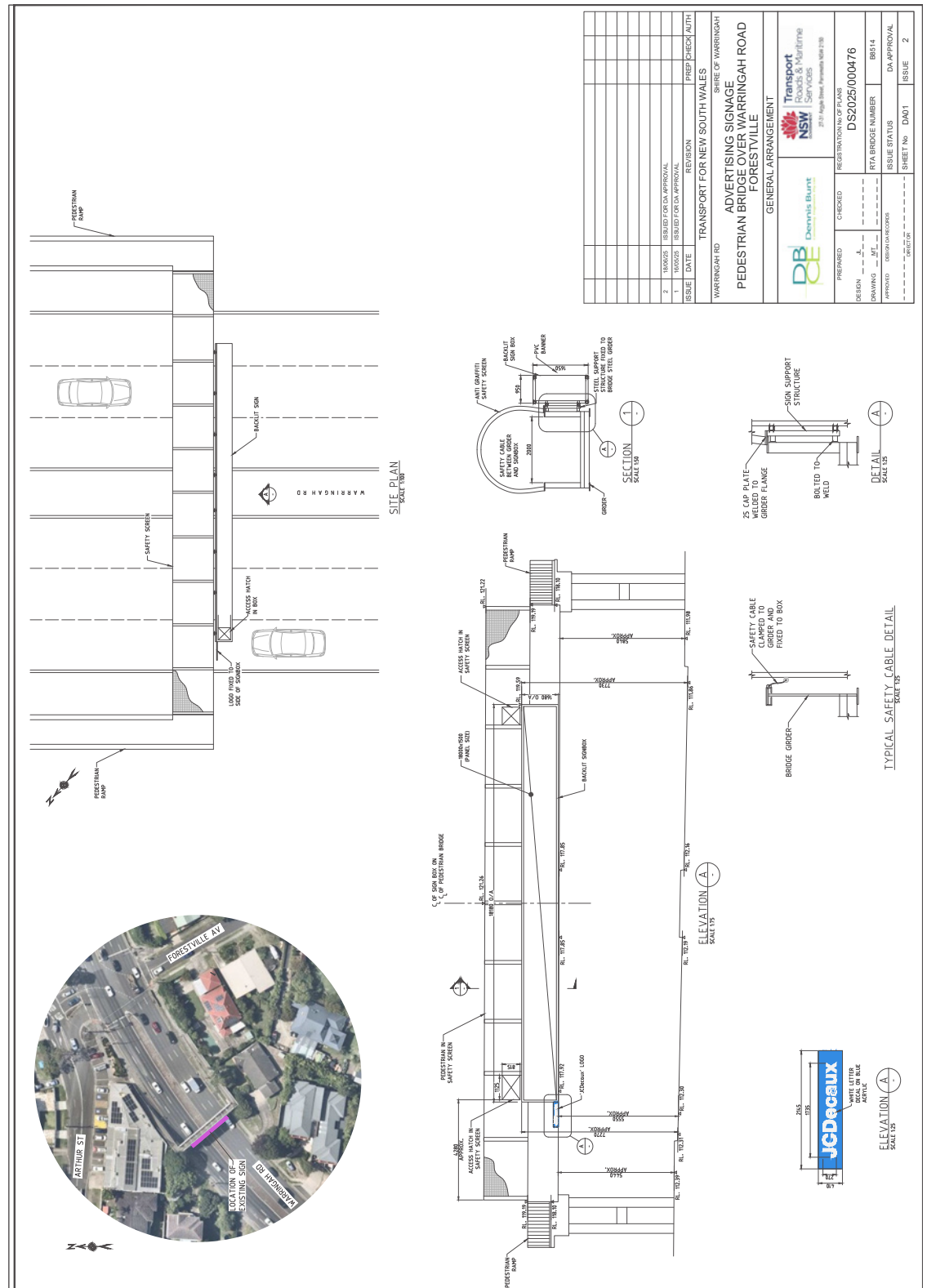
Senior Lighting Designer

Electrolight Sydney

24/06/25

*This design certification is only valid if the existing signage operates in accordance with this report, which includes not exceeding the maximum luminance limit outlined in Table 2 of Section 5. The luminance of the signage can be verified via site measurement, with luminance readings taken at night with the signage displaying a 100% white image.

EXISTING SIGNAGE LOCATION AND ELEVATIONS



APPENDIX B
OBTRUSIVE LIGHTING CALCULATIONS

Environmental Zone Legend:

- A0
- A1
- A2
- A3
- A4
- Property within 100m of signage



APPENDIX B

OBTRUSIVE LIGHTING CALCULATIONS

Calculation Summary			
Project: A4			
Label	CalcType	Units	Max
9_3 Aldinga Pl_Ill_Seg1	Obtrusive - Ill	Lux	0.08
9_3 Aldinga Pl_Ill_Seg2	Obtrusive - Ill	Lux	0.00
9_3 Aldinga Pl_Ill_Seg3	Obtrusive - Ill	Lux	0.11
9_3 Aldinga Pl_Ill_Seg4	Obtrusive - Ill	Lux	0.00

Calculation Summary			
Project: A3			
Label	CalcType	Units	Max
684 Warringah Rd_Ill_Seg1	Obtrusive - Ill	Lux	1.71
684 Warringah Rd_Ill_Seg2	Obtrusive - Ill	Lux	0.07
686 Warringah Rd_Ill_Seg1	Obtrusive - Ill	Lux	0.00
686 Warringah Rd_Ill_Seg2	Obtrusive - Ill	Lux	0.95
688 Warringah Rd_Ill_Seg1	Obtrusive - Ill	Lux	0.00
688 Warringah Rd_Ill_Seg2	Obtrusive - Ill	Lux	0.56
688 Warringah Rd_Ill_Seg3	Obtrusive - Ill	Lux	0.04
779 Warringah Rd_Ill_Seg1	Obtrusive - Ill	Lux	0.33
779 Warringah Rd_Ill_Seg2	Obtrusive - Ill	Lux	0.05
781 Warringah Rd_Ill_Seg1	Obtrusive - Ill	Lux	0.02
781 Warringah Rd_Ill_Seg2	Obtrusive - Ill	Lux	1.17
781 Warringah Rd_Ill_Seg3	Obtrusive - Ill	Lux	0.23
781 Warringah Rd_Ill_Seg4	Obtrusive - Ill	Lux	0.91
781 Warringah Rd_Ill_Seg5	Obtrusive - Ill	Lux	1.87
783 Warringah Rd_Ill_Seg1	Obtrusive - Ill	Lux	0.37
783 Warringah Rd_Ill_Seg2	Obtrusive - Ill	Lux	0.05
783 Warringah Rd_Ill_Seg3	Obtrusive - Ill	Lux	0.29
785 Warringah Rd_Ill_Seg1	Obtrusive - Ill	Lux	0.00
785 Warringah Rd_Ill_Seg2	Obtrusive - Ill	Lux	0.31
791 Warringah Rd_Ill_Seg1	Obtrusive - Ill	Lux	0.00
791 Warringah Rd_Ill_Seg2	Obtrusive - Ill	Lux	0.12
791 Warringah Rd_Ill_Seg3	Obtrusive - Ill	Lux	0.00
791 Warringah Rd_Ill_Seg4	Obtrusive - Ill	Lux	0.04
9 Aldinga Pl_Ill_Seg1	Obtrusive - Ill	Lux	0.22
9 Aldinga Pl_Ill_Seg2	Obtrusive - Ill	Lux	0.16
9_2 Aldinga Pl_Ill_Seg1	Obtrusive - Ill	Lux	0.12
9_2 Aldinga Pl_Ill_Seg2	Obtrusive - Ill	Lux	0.00
9_2 Aldinga Pl_Ill_Seg3	Obtrusive - Ill	Lux	0.15
9_2 Aldinga Pl_Ill_Seg4	Obtrusive - Ill	Lux	0.00

APPENDIX B
THRESHOLD INCREMENT CALCULATIONS



Calculation Summary			
Project: TI			
Label	CalcType	Units	Max
Warringah Rd Eastbound	Obtrusive - TI	%	2.70

APPENDIX B

OBTRUSIVE AND THRESHOLD INCREMENT CALCULATIONS

Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A3 - Medium District Brightness, Curfew
Filename: 3724.5 - Warringah Rd, Forestville NSW - Rev B
23/06/2025 10:06:36 AM

Illuminance

Maximum Allowable Value: 2 Lux

Calculations Tested (29):

Calculation Label	Test Results	Max. Illum.
781 Warringah Rd_III_Seg1	PASS	0.02
781 Warringah Rd_III_Seg2	PASS	1.17
781 Warringah Rd_III_Seg3	PASS	0.23
781 Warringah Rd_III_Seg4	PASS	0.91
781 Warringah Rd_III_Seg5	PASS	1.87
684 Warringah Rd_III_Seg1	PASS	1.71
684 Warringah Rd_III_Seg2	PASS	0.07
686 Warringah Rd_III_Seg1	PASS	0.00
686 Warringah Rd_III_Seg2	PASS	0.95
688 Warringah Rd_III_Seg1	PASS	0.00
688 Warringah Rd_III_Seg2	PASS	0.56
688 Warringah Rd_III_Seg3	PASS	0.04
9 Aldinga PI_III_Seg1	PASS	0.22
9 Aldinga PI_III_Seg2	PASS	0.16
9_2 Aldinga PI_III_Seg1	PASS	0.12
9_2 Aldinga PI_III_Seg2	PASS	0.00
9_2 Aldinga PI_III_Seg3	PASS	0.15
9_2 Aldinga PI_III_Seg4	PASS	0.00
779 Warringah Rd_III_Seg1	PASS	0.33
779 Warringah Rd_III_Seg2	PASS	0.05
783 Warringah Rd_III_Seg1	PASS	0.37
783 Warringah Rd_III_Seg2	PASS	0.05
783 Warringah Rd_III_Seg3	PASS	0.29
785 Warringah Rd_III_Seg1	PASS	0.00
785 Warringah Rd_III_Seg2	PASS	0.31
791 Warringah Rd_III_Seg1	PASS	0.00
791 Warringah Rd_III_Seg2	PASS	0.12
791 Warringah Rd_III_Seg3	PASS	0.00
791 Warringah Rd_III_Seg4	PASS	0.04

Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A4 - High District Brightness, Curfew
Filename: 3724.5 - Warringah Rd, Forestville NSW - Rev B
23/06/2025 10:05:54 AM

Illuminance

Maximum Allowable Value: 5 Lux

Calculations Tested (4):

Calculation Label	Test Results	Max. Illum.
9_3 Aldinga PI_III_Seg1	PASS	0.08
9_3 Aldinga PI_III_Seg2	PASS	0.00
9_3 Aldinga PI_III_Seg3	PASS	0.11
9_3 Aldinga PI_III_Seg4	PASS	0.00

Obtrusive Light - Compliance Report

AS/NZS 4282:2023, A3 - Medium District Brightness, Curfew
Filename: 3724.5 - Warringah Rd, Forestville NSW TI - Rev B
23/06/2025 10:12:41 AM

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (1):

Calculation Label	Adaptation Luminance	Test Results
Warringah Rd Eastbound	1	PASS