

LIGHTING ASSESSMENT

**LIGHT SPILL IMPACT  
ASSESSMENT AND  
EXTERNAL LIGHTING  
STRATEGY FOR STORAGE  
WAREHOUSE AT 134  
SOMERSBY FALLS ROAD**

ELECTRICAL SERVICES

**JHA**

CONSULTING ENGINEERS

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## DOCUMENT CONTROL SHEET

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# 1 EXECUTIVE SUMMARY

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## 1.1 INTRODUCTION

JHA Consulting Engineers have been engaged as the lighting consultant by Jackson Environment and Planning Pty Ltd to produce a report for Light Spill Impact Assessment and External Lighting Strategy for the Storage Warehouse at 134 Somersby Falls Road. The report is primarily on three key areas with regards to lighting, namely:

- External Lighting for proposed Building
- Obtrusive Lighting
- Impact of external lighting on Somersby Falls Road

The Light Spill Impact assessment and External Lighting Strategy is to include the external area of the proposed warehouse and the hardstand areas to Somersby Falls Road. No lighting will be installed on the lot that will remain undeveloped.

The main objective of the design will focus on a lighting proposal that can satisfy the requirements of:

1. Lighting design for internal roads and outdoor carpark in accordance with AS/NZS 1158.3.1:2020.
2. Lighting design in accordance with AS/NZS 4282:2023.

This report includes the following:

- A plan detailing the height, location, type of light fittings and the proposed hours of use.
- Demonstration of adequate external lighting to meet AS/NZS 1158.3.1:2020.
- Demonstrate compliance with obtrusive lighting to meet AS/NZS 4282:2023.
- Impact Assessment
- Proposed management & mitigation measures

## 2 OVERVIEW OF PROPOSAL

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### 2.1 AUSTRALIAN STANDARDS

Study and assessment findings are conducted in accordance with;

- AS/NZS 1158.3.1:2020 - Lighting for roads and public spaces
- AS/NZS 1158.3.1:2020 – Lighting for roads and public spaces – Entry roadway
- AS/NZS 4282:2023 - Control of the obtrusive effects of outdoor lighting

As part of this report, lighting calculations for following areas are done:

1. External lighting for the proposed warehouse including pedestrian lighting, external carpark lighting & vehicle movement lighting, and concrete hardstand lighting.
2. Obtrusive Lighting calculation at Somersby Falls Road and nearby 2-storey industrial shed and residence.

Refer to Appendix A for lighting and non-obtrusive lighting calculations, proposed type of fittings, location of fitting & mounting height.

### 2.2 EXTERNAL LIGHTING – PROPOSED BUILDING

JHA recommend a minimum of the following sub-categories lighting systems be installed:

- High Night-time vehicle/pedestrian movements – PC1 lighting category

- Medium Night-time vehicle/pedestrian movements – PC2 lighting category
- Outdoor parking that includes disabled parking – PCD lighting category

JHA has designed the external lighting system for the proposed warehouse to achieve the above requirement in compliance with AS1158.

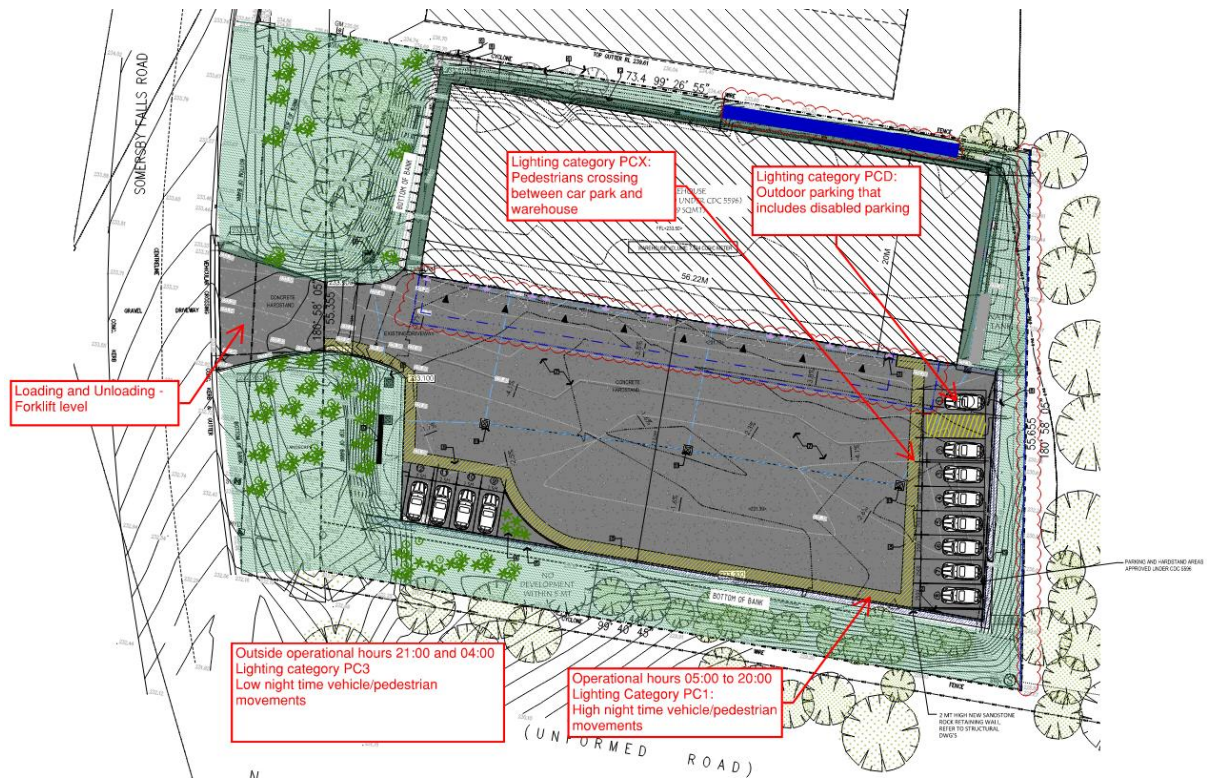


Figure 2.1 – External Area Lighting proposed warehouse

**TABLE 2.5**  
**LIGHTING SUBCATEGORIES FOR OUTDOOR CAR PARKS**  
**(INCLUDING ROOF-TOP CAR PARKS)**

1	2	3	4
Type of area	Selection criteria <sup>a,c</sup>		
	Night time vehicle and/or pedestrian movements	Fear of crime	Applicable lighting subcategory <sup>b</sup>
Parking spaces, aisles and circulation roadways	High	High	PC1
	Medium	Medium	PC2
	Low	Low	PC3
Designated parking spaces specifically intended for people with disabilities	N/A	N/A	PCD
For any designated areas for pedestrians to cross	N/A	N/A	PCX

Figure 2.2- Recommended Lighting Categories for Outdoor Carparks (taken from AS1158 part 3.1)

**TABLE 3.7**  
**VALUES OF LIGHT TECHNICAL PARAMETERS FOR OUTDOOR**  
**CAR PARKS (INCLUDING ROOF-TOP CAR PARKS)**

1	2	3	4	5
Lighting subcategory	Light technical parameters (LTP)			
	Average horizontal illuminance <sup>a,b</sup> ( $\bar{E}_h$ )	Point horizontal illuminance <sup>a,b</sup> ( $E_{Ph}$ )	Illuminance (horizontal) uniformity <sup>c</sup> Cat. P ( $U_{E2}$ )	Point vertical illuminance <sup>a,b</sup> ( $E_{Pv}$ )
	lx	lx		lx
PC1	14	3	8	3
PC2	7	1.5	8	1
PC3	3.5	0.7	8	—
PCD <sup>d</sup>	—	$\geq 14$ and $\geq (\bar{E}_h)^d$	—	—
PCX <sup>e</sup>	21	5	8	—

Figure 2.3 – Subsequent Minimum Light Level for a PC3 category Light System (taken from AS1158 part 3.1)

**TABLE 3.1**  
**RECOMMENDED LIGHT TECHNICAL PARAMETERS**  
**FOR GENERAL OUTDOOR AREAS**

Description	Basic operating characteristics	<sup>*</sup> E <sub>av</sub> lx	<sup>+</sup> E <sub>min</sub> lx	<sup>#</sup> U	<sup>†</sup> GR <sub>max</sub>
Assembly, fabrication, manufacture or maintenance	General access and movement around work areas and related areas.	80	10	5	45
Loading and unloading – manual	Loading and unloading of trucks by manual labour including manually moving objects between the truck and another form of transport.	40	5	5	45
Loading and unloading – forklift	Loading and unloading of trucks by forklift, the area surrounding the truck and route of the forklift.	40	5	5	45
General storage – pedestrian access with through traffic	Large open area for storage of large objects; placement, movement and retrieval of objects by machines with integrated movement and working light; general through traffic; controlled pedestrian access; no access to the general public.	20	2.5	7	50
General storage – pedestrian access	Large open area for storage of large objects; placement, movement and retrieval of objects by machines with integrated movement and working light; through traffic –internal only (site-inducted personnel); site-inducted pedestrian access only.	10	1	7	50
General storage – no pedestrian access	Large open area for storage of large objects; placement, movement and retrieval of objects by machines with integrated movement and working light; minimal through traffic; no pedestrian access; no access to the general public.	5	1	10	55

- <sup>\*</sup> E<sub>av</sub> = average illuminance (lx)
- <sup>+</sup> E<sub>min</sub> = minimum illuminance (lx)
- <sup>#</sup> U = uniformity of illuminance
- <sup>†</sup> GR<sub>max</sub> = CIE glare rating (maximum)

Figure 2.4 – Light Requirement for General outdoor areas (taken from AS1680 Part 5 Outdoor Workplace Lighting)

### 2.3 OBTRUSIVE LIGHTING

Obrusive Lighting calculation for the adjacent property at Somersby falls road and the nearby 2 storey industrial shed and residence. The proposed lighting design complies to AS/NZS 4282:2023 (control of the obtrusive effects of outdoor lighting specifically to A2 Low district brightness) while required lighting levels are achieved for roadways and external areas of buildings.

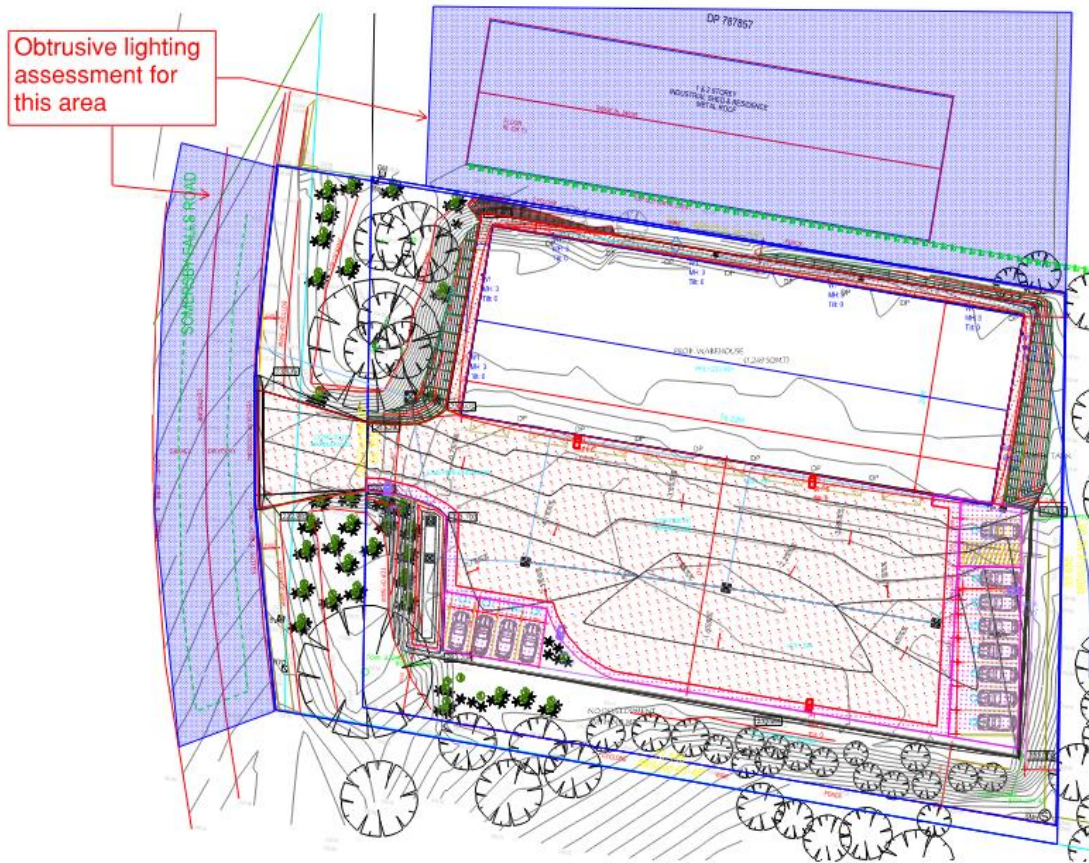


Figure 2.5 – Obtrusive Lighting

**TABLE 3.1**  
**ENVIRONMENTAL ZONES**

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	Refer AS/NZS1158.1.1
R1	Residences near local roads with significant setback	Refer AS/NZS 1158.3.1
R2	Residences near local roads	Refer AS/NZS 1158.3.1
R3	Residences near a roundabout or local area traffic management device	Refer AS/NZS 1158.3.1
RX	Residences near a pedestrian crossing	Refer AS/NZS 1158.4

NOTE: Recreational areas are not considered commercial.

Figure 2.6- Recommended Lighting Zone for Obtrusive Lighting (taken from AS4282 part 3.1)

**TABLE 3.2**  
**MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS**

Zones	Vertical illuminance levels ( $E_v$ ) lx		Threshold increment (TI)		Sky glow
	Non-curfew	Curfew	%	Default adaptation level ( $L_{ad}$ )	Upward light ratio
A0	See Note 1	0	N/A	N/A	0
A1	2	0.1	N/A	N/A	0
A2	5	1	20%	0.2	0.01
A3	10	2	20%	1	0.02
A4	25	5	20%	5	0.03
TV	See Table 3.4	N/A	20%	10	0.08
V	N/A	4	Note 2	Note 2	Note 2
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

NOTES:

- 1 For A0,  $E_v$  shall be as close to zero as practicable without impacting safety considerations.
- 2 Refer to AS/NZS 1158.1.1.
- 3 Refer to AS/NZS 1158.3.1.
- 4 Refer to AS/NZS 1158.4.
- 5 N/A means 'Not Applicable'.
- 6 For an internally illuminated sign in an A2 zone,  $L_{ad} \leq 0.25$  cd/m<sup>2</sup>.

Figure 2.7- Subsequent Light Level of A2 Zone for Obtrusive Lighting (taken from AS4282 part 3.1)

**Notes:**

Obtrusive Light - Compliance Report  
AS/NZS 4282:2019, A2 - Low District Brightness, Curfew  
Filename: External Car Park  
1/03/2024 3:59:52 PM

**Illuminance**  
Maximum Allowable Value: 1 Lux

Calculations Tested (1):

Calculation Label	Test Results	Max. Illum.
ObtrusiveLight_North_Ill_Seg1	PASS	0.7

**Luminous Intensity (Cd) At Vertical Planes**  
Maximum Allowable Value: 1000 Cd

Calculations Tested (1):

Calculation Label	Test Results
ObtrusiveLight_North_Cd_Seg1	PASS

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

Calculations Tested (1):

Calculation Label	Adaptation Luminance	Test Results
ObtrusiveLight_TI_Falls Road	0.2	PASS

Figure 2.8- Designed Obtrusive lighting Compliance Report

### 3 EXISTING ENVIRONMENT

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The adjacent property at Somersby Falls Road (Lot 2 and 3, DP787857) is an industrial property, adjacent to the northern boundary of the proposed site. It can be assumed that the adjacent property is zoned A3 Medium district brightness. All building developments will be located within the A3 zone.



Figure 3.1-. Current property boundaries (Lot 1, DP787857)

### 4 REDUCING THE IMPACT OF EXTERNAL LIGHTING TO SOMERSBY FALLS ROAD AND NEARBY 2-STOREY INDUSTRIAL SHED AND RURAL RESIDENCE

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In accordance with AS/NZS 4282:2023 – JHA’s design can achieve conformance to A2 - Low District Brightness, Non-Curfew L1. A2 is defined (via Table 3.1) as sparsely inhabited rural and semi-rural areas.

**TABLE 3.1**  
**ENVIRONMENTAL ZONES**

<b>Zones</b>	<b>Description</b>	<b>Examples</b>
<b>A0</b>	<b>Intrinsically dark</b>	UNESCO Starlight Reserve. IDA Dark Sky Parks. Major optical observatories No road lighting -unless specifically required by the road controlling authority
<b>A1</b>	<b>Dark</b>	Relatively uninhabited rural areas No road lighting - unless specifically required by the road controlling authority
<b>A2</b>	<b>Low district brightness</b>	Sparsely inhabited rural and semi-rural areas
<b>A3</b>	<b>Medium district brightness</b>	Suburban areas in towns and cities
<b>A4</b>	<b>High district brightness</b>	Town and city centres and other commercial areas Residential areas abutting commercial areas

Figure 3.2- Table 3.1 Environmental Zones

The maximum allowable illuminance for this category is 5 lux and for both areas calculated, JHA’s design has achieved a 1 lux value indicating a PASS value on this requirement. This is calculated at 10m beyond the site boundary as per AS/NZS 4282:2023 – Control of the obtrusive effects of outdoor lighting.

The aforementioned properties and surrounding zoned areas are beyond the 10m site boundary and are therefore not affected or incorporated in these calculations.

In addition, the lighting products used are full cut-off luminaires which limit the uplight component and mitigate/reduce sky glow. Furthermore, they are using asymmetric optics and are positioned horizontally flat with zero-degree tilt. This assists in achieving the required 0% Upward Waste Light Ratio and helps to maintain controlled illumination without distributing light into opposing and boundary properties.

## 5 IMPACT ASSESSMENT

In order to comply with the external lighting standard JHA recommends installation of new lighting system with high efficiency and optically controlled LED pole-mounted lighting.

The use of pole-mounted lighting takes advantage of illuminating from a height, which provides better light distribution along roadways, making for a much safer environment for places with pedestrian/vehicle interactions. The installation of pole-mounted lighting will minimise the number of light fittings required to illuminate the roadway and provide more uniform light. This enables better visibility for drivers and pedestrians through the minimisation of light pooling around the light source.

## 6 PROPOSED MANAGEMENT AND MITIGATION MEASURES

JHA recommends that all pole-mounted lighting should be located on the pedestrian side of the road to maximise light distribution on the pedestrian part of the roadway. It is recommended that a pole light with a type I or type II lighting distribution with sharp rear light spill cut-off is used to provide controlled uniform light along the length of the roadway, whilst minimising any spill to neighbouring buildings.

The height and number of poles have been chosen for the most optimised solution. The reserve road area is illuminated using asymmetric optics with 0-degree tilt while the area surrounding the building is illuminated using anti-ligature wall light using symmetric optics with 0-degree tilt.

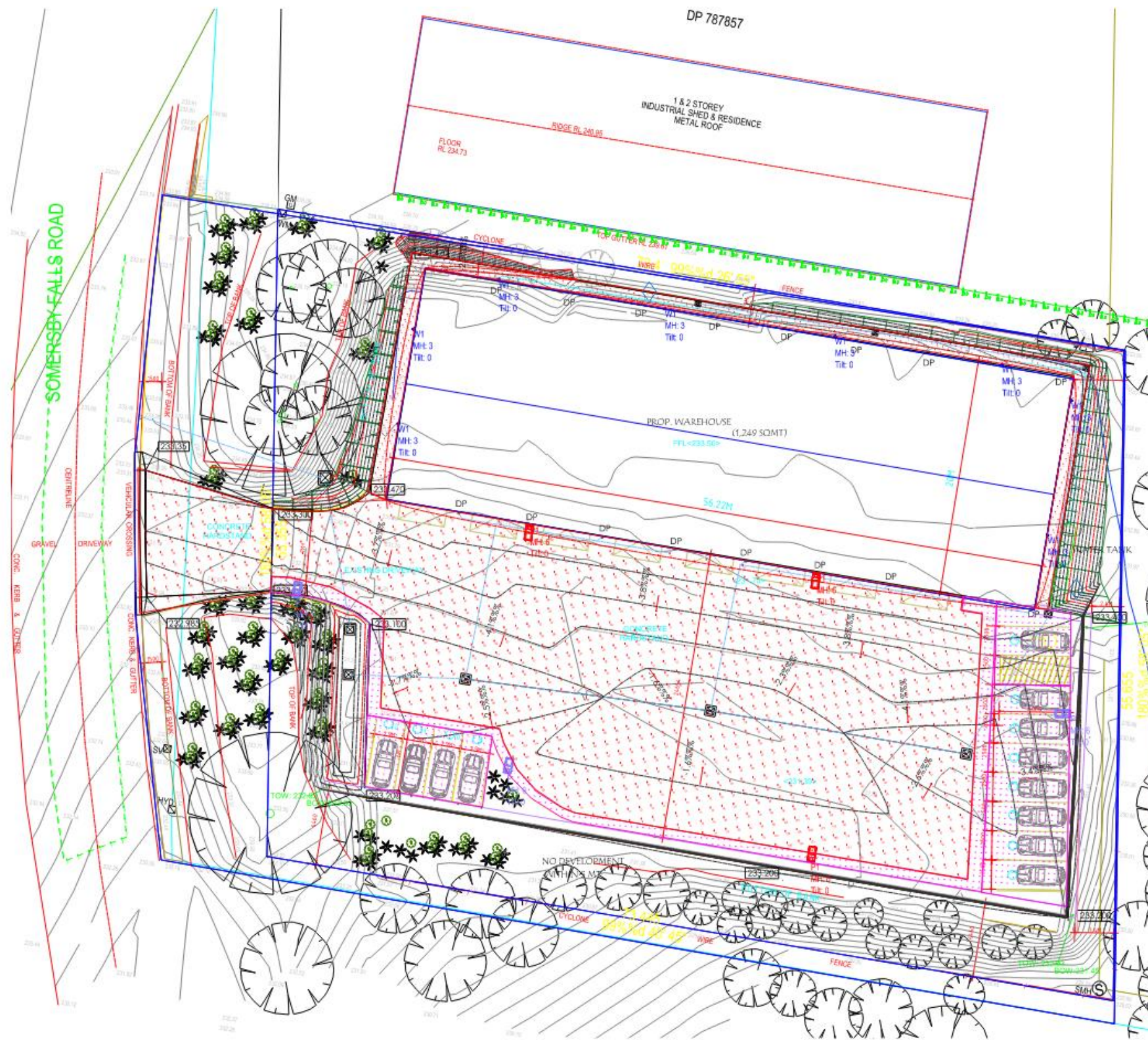
This provides sufficient illumination creating a safe localised environment with clear occupational visibility and low glare risk.

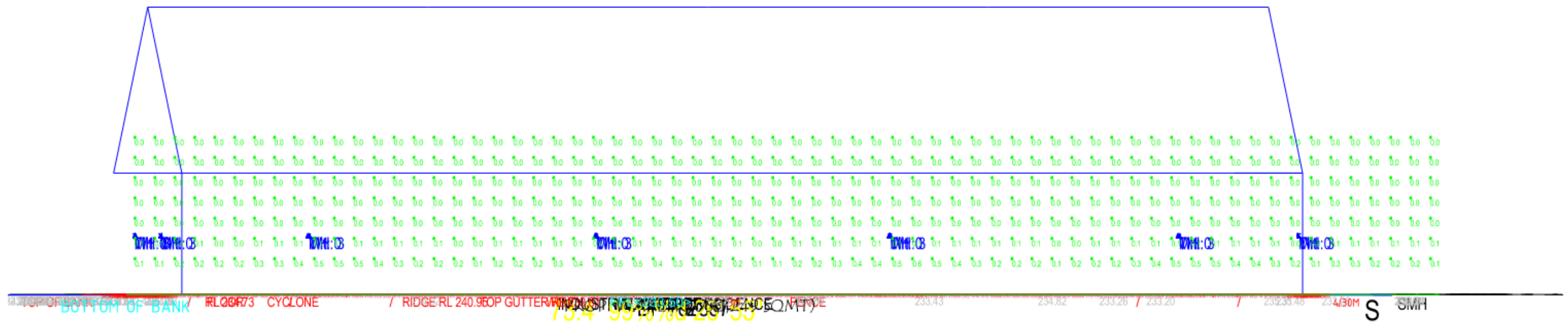
## 7 CONCLUSION

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When selecting pole-mounted light fittings, careful consideration must be taken to ensure that the light spill from the fittings is controlled away from abutting areas. Poorly controlled lighting may result in obtrusive lighting. JHA recommends that optically controlled LED pole-mounted light fittings be used along the roadways and within the complex to mitigate the risk of obtrusive lighting. The use of optically controlled LED lighting will also provide much better uniformity of light distribution across the roadway, greatly increasing visibility for both drivers and pedestrians. The attached calculations show that the selected fittings will provide lighting to the proposed development compliant to AS 1158 ensuring the necessary illumination to the site and lack of obtrusive lighting to any building in the vicinity of the development.

## 8 APPENDIX A LIGHTING AND NON-OBTRUSIVE LIGHTING CALCULATIONS





ROOM SUMMARY			
Mounting Height (m)	Ceiling Height (m)	Reflectance (C\W\F)	Tilt
AS SHOWN	VARIES	N/A	N/A

## RESULTS

CALCULATION SUMMARY											
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min	Max/Avg	PtSpcLr	PtSpcTb	Calc Height
Car Park 1	Illuminance	Lux	60	138	4	15.1	34.5	2.3	0.5	0.5	0
Car Park 2	Illuminance	Lux	35	123	3	11.5	41.0	3.6	0.5	0.5	0
Car Park Disable	Illuminance	Lux	69	116	28	2.5	4.1	1.7	0.5	0.5	0
Hardstand	Illuminance	Lux	40	136	5	8.0	27.2	3.4	1	1	0
Walk Way - Around	Illuminance	Lux	7	39.3	0.5	14.5	78.6	5.4	0.5	0.5	0
Walk Way - Front	Illuminance	Lux	43	139	4	10.8	34.8	3.2	0.5	0.5	0

LUMINAIRE SCHEDULE									
Qty	Label	Arrangement	Total Lamp Lumens	Lum. Watts	LLF	Description	Total Watts	Tag	
3	P	Single	22068	156.1	0.800	FEEZE L ASY3_1 80 LED 3000K	468.3	FEEZEL_3180H_3080	
3	P1	Single	22068	156.1	0.800	FEEZE L ASY4_0 80 LED 3000K	468.3	FEEZEL_4080H_3080	
8	W1	Single	555.75	4.6	0.800	DROID S Wall Light IP65 IK11 Symmetric Optic 3000K Ra80 High Power	36.8	DROIDSH-DLxx-3080x	

ROOM SUMMARY			
Mounting Height (m)	Ceiling Height (m)	Reflectance (C\W\F)	Tilt
AS SHOWN	VARIABLES	N/A	N/A

## RESULTS - OBTRUSIVE

CALCULATION SUMMARY											
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min	Max/Avg	PtSpcLr	PtSpcTb	Calc Height
ObtrusiveLight_North_Cd_Seg1	Obtrusive - Cd	N.A.	5	41	1	5.2	41.0	7.8	1	1	N.A.
ObtrusiveLight_North_Ill_Seg1	Obtrusive - Ill	Lux	0	0.7	0.0	N.A.	N.A.	N.A.	1	1	N.A.
ObtrusiveLight_TI_Falls Road	Obtrusive - TI	%	0	1	0	N.A.	N.A.	N.A.	1	0	N.A.

LUMINAIRE SCHEDULE									
Qty	Label	Arrangement	Total Lamp Lumens	Lum. Watts	LLF	Description	Total Watts	Tag	
3	P	Single	22068	156.1	1.00	FEEZE L ASY3_1 80 LED 3000K	468.3	FEEZEL_3180H_3080	
3	P1	Single	22068	156.1	1.00	FEEZE L ASY4_0 80 LED 3000K	468.3	FEEZEL_4080H_3080	
8	W1	Single	555.75	4.6	1.00	DROID S Wall Light IP65 IK11 Symmetric Optic 3000K Ra80 High Power	36.8	DROIDSH-DLxx-3080x	

## Notes:

Obtrusive Light - Compliance Report  
AS/NZS 4282:2019, A2 - Low District Brightness, Curfew  
Filename: External Car Park  
1/03/2024 3:59:52 PM

Illuminance  
Maximum Allowable Value: 1 Lux

Calculations Tested (1):

Calculation Label	Test Results	Max. Illum.
ObtrusiveLight_North_Ill_Seg1	PASS	0.7

Luminous Intensity (Cd) At Vertical Planes  
Maximum Allowable Value: 1000 Cd

Calculations Tested (1):

Calculation Label	Test Results
ObtrusiveLight_North_Cd_Seg1	PASS

Threshold Increment (TI)  
Maximum Allowable Value: 20 %

Calculations Tested (1):

Calculation Label	Adaptation Luminance	Test Results
ObtrusiveLight_TI_Falls Road	0.2	PASS



**TYPE P**

**FEEZE M**

Versatile area light with smart driver options

Multiple sizes, beam spreads, and outputs

Multiple mounting options

CODE: FEEZEL\_3180H\_3080



**TYPE P1**

**FEEZE M**

Versatile area light with smart driver options

Multiple sizes, beam spreads, and outputs

Multiple mounting options

CODE: FEEZEL\_4080H\_3080



**TYPE W1**

**DROID**

Anti-ligature Wall Light

IK10-20J Impact

IP65

CODE: DROIDSH-DLxx-3080x