DORAN DRIVE, MANDALA PDE

SPECIALIST LIGHTING CONCEPTS

REV F

APRIL
2022

01 CONTENTS

This document covers the following;

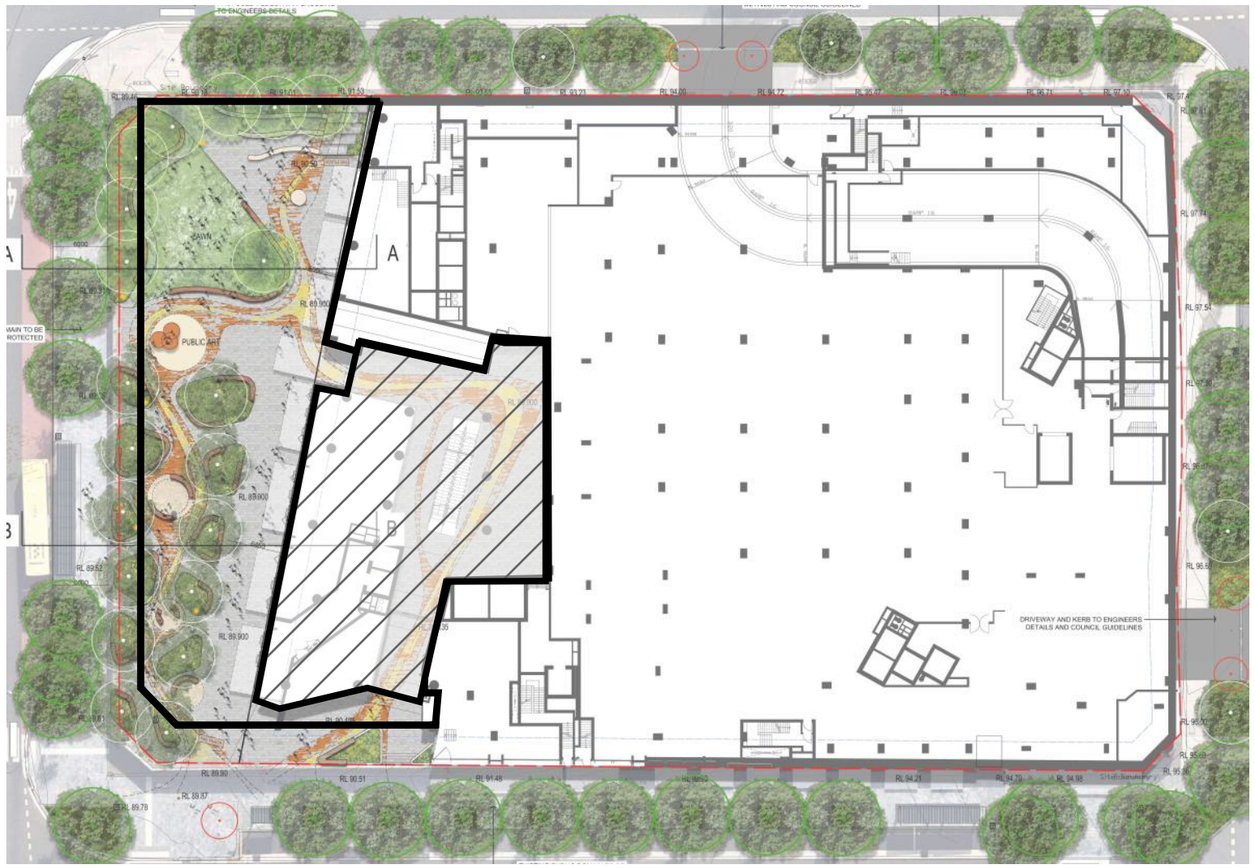
02 INTRODUCTION

The purpose of this lighting report is to develop a comprehensive Public Lighting for Doran Drive. This report would guide a strategic approach to the public domain lighting by establishing design principles, a palette selection, technical requirements and performance standard.

To encourage greater public use, it is vital to allow for way-finding and safety. Lighting is used to highlight key points, boundaries, signage to assist and guide pedestrians and enhance the site's night time presence. The importance of allowing these elements to be illuminated allows for visual links and cues for orientation and legibility of the area. The perception of brightness is greatly improved and increased through lighting techniques that focus on lighting vertical planes and elements of architectural and urban structures as well as luminaire selection.

03 SCOPE OF WORKS

PUBLIC SPACES



GROUND -
PUBLIC ACCESS

UPPER GROUND LEVEL & LEVEL 1 -
PUBLIC ACCESS

PRIVATELY OWNED/ACCESSIBLE SPACES

LEVEL 2 -
PRIVATE ACCESS

LEVEL 3 -
PRIVATE ACCESS

LEVEL 06 -
PRIVATE ACCESS

LEVEL 8 -
PRIVATE ACCESS

LEVEL 9 -
PRIVATE ACCESS

04 GREEN STAR REQUIREMENTS

GREEN STAR DESIGN & AS BUILT V1.3

27.1 Light Pollution (1 point)

1 point is awarded where it can be demonstrated that one of the following specified reductions in light pollution has been achieved by the project.

A. Control of upward light output ratio (ULOR)
Project team must demonstrate that no external luminaire on the project has a ULOR that exceeds 5%, relative to its actual mounted orientation.
Project teams must demonstrate that the ULOR provided or calculated in the documentation, is relevant to the as-installed orientation of the luminaire. A luminaire with a ULOR as nominated in the manufacturers data sheet, will have a different ULOR when the mounting orientation of the luminaire is changed. In the event that any external luminaire is mounted in an orientation other that the one nominated by the manufacturer, the ULOR must be re-calculated and provided by the project teams.

Awnings
Awnings can be used as a means of achieving compliance with the 5% ULOR requirement where a section drawing showing the light output of the luminaire can be provided, and where the awning has the effect of blocking 95% of the output of the lamp above the horizontal. This credit cannot be awarded where it is not clear that the awning is a permanent structure.

B. Control of direct luminance in accordance with 27.1B.
The project team must demonstrate that direct illuminance from external luminaires on the project produces a maximum initial point illuminance value no greater than:

- 0.5 lux to the site boundary; and
- 0.1 lux to 4.5m beyond the site into the night sky, when modelled using a calculation plane set at the highest point of the building.

Calculations shall be in accordance to AS 4282:1997.
The calculation plane must cover the area between the site boundary and building facade or vertical service to be illuminated. The horizontal calculation plane shall be set at the top of the building fabric, excluding spires. Calculation plane grid poiints shall have a 0.5m spacing. All illumination results shall be reported to within 2 decimal points.

In addition to other types of external lighting, for the purpose of this credit luminaires inside glazed atria and those on he uppermost (uncovered) deck of an outdoor car park are considered to be external.
Emergency lights are excluded.

05 CRIME PREVENTION EXTRACTS

The following extracts highlight the potential crime risk caused by the proposed mixed use development within Mandala Parade Precinct. The following data are extracts from BRS's crime prevention report and serves to assist in identifying specific crimes prevalent in an area.

The purpose of this analysis has aided the proposed lighting categories that JHA deems to be appropriate for the proposed public domain areas within Mandala Parade Precinct and are highlighted in the subsequent pages.

Table 1: Crime Levels in Castle Hill and The Hills LGA

Level of Crime	Crime Type by Location	
	Castle Hill	The Hills LGA
HIGHEST LEVEL CRIME	No relevant crimes	No relevant crimes
HIGH LEVEL CRIME	No relevant crimes	Robbery
MEDIUM LEVEL CRIME	No relevant crimes	Steal from Dwelling Break and Enter (Dwelling) Steal from person Steal from Motor Vehicle
LOW LEVEL CRIME	No relevant crimes	No relevant crimes
LOWEST LEVEL CRIME	Steal from Dwelling Break and Enter (Dwelling) Assault (Domestic) Assault (Non - domestic) Malicious Damage to Property Steal from Person Robbery Steal from Motor Vehicle	Malicious Damage to Property Assault (Non -Domestic) Assault (Domestic)

EXTRACTS FROM BARKER RYAN STEWART'S CRIME PREVENTION REPORT

★ SITE LOCATION

Steal from Dwelling

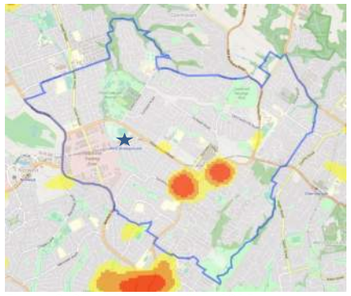


Figure 3: Steal from Dwelling 2015

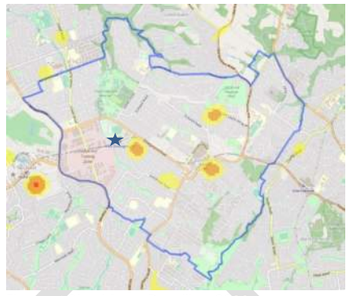


Figure 4:Steal from Dwelling 2020

Assault (Non- Domestic)

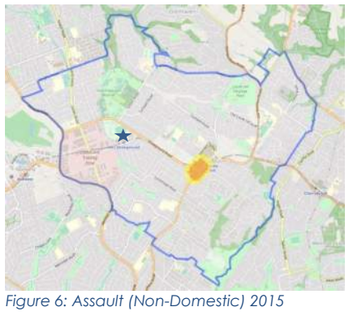


Figure 6: Assault (Non-Domestic) 2015

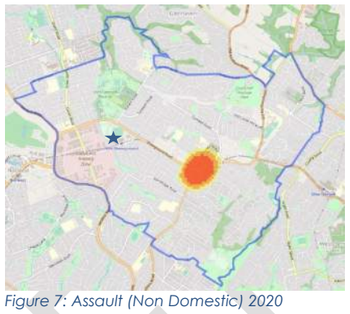


Figure 7: Assault (Non Domestic) 2020

Malicious Damage to Property

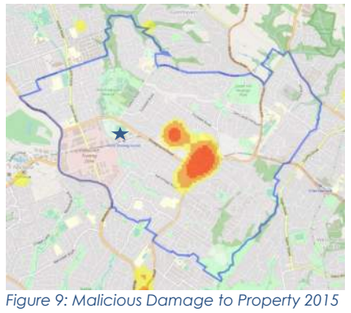


Figure 9: Malicious Damage to Property 2015

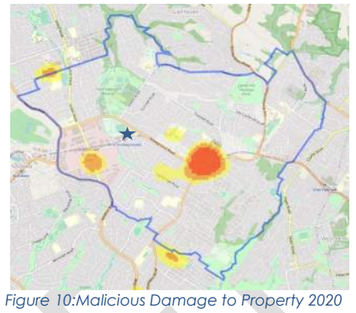


Figure 10:Malicious Damage to Property 2020

EXTRACTS FROM BARKER RYAN STEWART'S CRIME PREVENTION REPORT

06 PEDESTRIAN CATEGORY

The following highlighted subcategories are a recommended parameter by JHA.

Final selection of sub-categories to be client and end-user approved prior to design development and cross checked against any crime and night time movement statistics available.

TABLE 2.2
LIGHTING SUBCATEGORIES FOR PEDESTRIAN AND CYCLIST PATHS

1	2	3	4	5
Type of pathway		Selection criteria[a,b,c]		Applicable lighting subcategory
General description	Basic operating characteristics	Pedestrian/ cycle activity	Fear of crime	
Pedestrian or cycle orientated pathway, e.g. footpaths, including those along local roads[d] and arterial roads[e], walkways, lanes, park paths, cyclist paths	Pedestrian and or cycle traffic only	N/A	High	PP1[c]
		High	Medium	PP2[c]
		Medium	Medium	PP3
		Medium	Low	PP4
		Low	Low	PP5

[a] The selection criteria of Columns 3 to 4 should be separately evaluated. The highest level of any of the selection criteria that is deemed appropriate for the pathway will determine the applicable lighting subcategory.

[b] See Appendix A for guidance on choosing the applicable level of each selection criteria for the environment and purpose of a lighting scheme.

[c] Where there are vertical surfaces of high reflectance (e.g. light coloured walls bordering on an alleyway) alongside the pathway, the next lower lighting subcategory may be selected.

[d] Where the footpath is along a local road and subcategory PP1 or PP2 is selected, the light technical parameters for that subcategory should only apply to the formed footpath.

[e] Footpaths associated with arterial roads are deemed not to require separate lighting provided that—

(a) the road is lit to at least the applicable level of Category V lighting conforming to AS/NZS 1158.1.1; and

(b) the footpath is unshaded, e.g. there are no substantially continuous building awnings, trees (refer to AS/NZS 1158.1.2) and the footpath is contiguous with the roadway.

TABLE 3.4
VALUES OF LIGHT TECHNICAL PARAMETERS FOR PATHWAYS AND CYCLIST PATHS

1	2	3	4	5
Lighting subcategory	Light technical parameters (LTP)			
	Average horizontal illuminance[a,b] ($\bar{E}_h$) lx	Point horizontal illuminance[a,b,d] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})	Point vertical illuminance[a,b] (E_{Pv}) lx
PP1	10	2	5	1
PP2	7	1	5	0.3
PP3	3	0.5	5	0.1
PP4	1.5	0.25	5	0.05[e]
PP5	0.85	0.14	5	0.02[e]

[a] These values are maintained. See Clause 3.2 pertaining to lumen derating values for non-white light sources.

[b] Conformance is achieved by being greater than or equal to the applicable table value.

[c] Conformance is achieved by being less than or equal to the applicable table value.

[d] Conformance of 50% of E_{ph} shall also be demonstrated over an area of 5 m either side of the pathway—where a verge exists—or up to any structure/fence/property boundary that forms the edge of the pathway, unless deemed otherwise by the relevant authorities (see Clause 3.1.3.5).

[e] For luminaires with mounting heights of 1.5 m or less, the E_{Pv} values need not be applied.

TABLE 2.3
LIGHTING SUBCATEGORIES FOR PUBLIC ACTIVITY AREAS (EXCLUDING CAR PARKS)

1	2	3	4	5	6
Type of area or activity		Selection criteria[a,b]			Applicable lighting subcategory
General description	Basic operating characteristics	Night time vehicle movements	Fear of crime	Need to enhance amenity	
Areas primarily for pedestrian use, e.g. city, town, suburban centres, including outdoor shopping precincts, malls, open arcades, town squares, civic centres	Generally pedestrian movement only	N/A	High	High	PA1
		Medium	Medium	Medium	PA2
		Low	Low	N/A	PA3
Transport terminals and interchanges, service areas[c]	Mixed pedestrian and vehicle movement	High	High	High	PA1
		Medium	Medium	Medium	PA2
		Low	Low	N/A	PA3

[a] The selection criteria of Columns 3 to 5 should be separately evaluated. The highest level of any of the selection criteria that is deemed appropriate for the area type will determine the applicable lighting subcategory.

[b] See Appendix A for guidance on choosing the applicable level of each selection criteria for the environment and purpose of the lighting scheme.

[c] See Clause 1.1.1.

NOTE: See Table 2.5 for lighting subcategories applicable to outdoor car parks, including roof-top car parks.

TABLE 3.5
VALUES OF LIGHT TECHNICAL PARAMETERS FOR PUBLIC ACTIVITY AREAS (EXCLUDING CAR PARKS)

1	2	3	4	5
Lighting subcategory	Light technical parameters (LTP)			
	Average horizontal illuminance[a,b] ($\bar{E}_h$) lx	Point horizontal illuminance[a,b] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})	Point vertical illuminance[a,b,d] (E_{Pv}) lx
PA1	21	7	8	7
PA2	14	4	8	4
PA3	7	2	8	2

[a] These values are maintained.

[b] Conformance is achieved by being greater than or equal to the applicable table value.

[c] Conformance is achieved by being less than or equal to the applicable value.

TABLE 2.4
LIGHTING SUBCATEGORIES FOR CONNECTING ELEMENTS

Type of area	Applicable lighting subcategory
Subways, including associated ramps or stairways	PE1
Steps and stairways, ramps, footbridges, pedestrian ways	PE2
Ramps and footbridges associated with low use pathways (e.g. in parks and reserves)	PE3

NOTE: Subways are listed as a separate subcategory because of a fear of crime.

TABLE 3.6
VALUES OF LIGHT TECHNICAL PARAMETERS FOR CONNECTING ELEMENTS

1	2	3	4	5
Lighting subcategory	Light technical parameters (LTP)			
	Average horizontal illuminance[a,b,d] ($\bar{E}_h$) lx	Point horizontal illuminance[a,b] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})	Point vertical illuminance[a,b] (E_{Pv}) lx
PE1	35	17.5	8	17.5
PE2	Same as for highest lighting subcategory applying to areas that abut the connecting element but, where forming part of a road or pathway, to be not less than subcategory PA3 in Table 3.5.			
PE3	Same as for highest lighting subcategory applying to areas that abut the connecting element but, where forming part of a road or pathway, to be not less than subcategory PP3 in Table 3.4.			

[a] These values are maintained.

[b] Conformance is achieved by being greater than or equal to the applicable table value.

[c] Conformance is achieved by being less than or equal to the applicable value.

[d] For steps, the requirements assume that the noses of the treads are clearly delineated by a contrasting stripe or other equally effective means. If this does not apply, the illuminance should be at least twice the value specified.

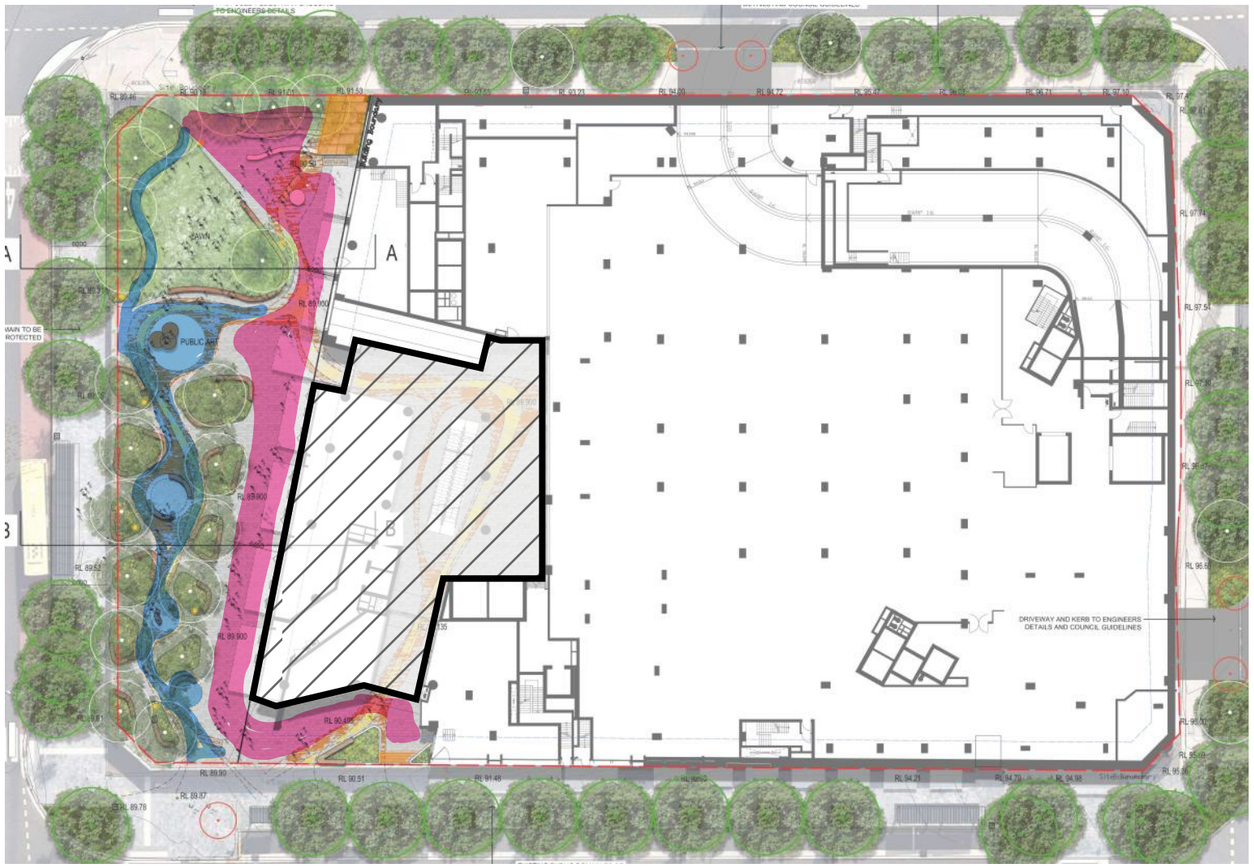
NOTES:

1 It is recommended that the walls of subways be finished in a light colour to facilitate inter-reflection of light within the space. Such inter-reflected light may be taken into account in the achievement of the specified light technical parameters.

2 See Section 4 for the design methods and requirements for use in assessing conformance to the specified light technical parameters.

PEDESTRIAN CATEGORY

PUBLIC SPACES



GROUND - PUBLIC ACCESS

NON- CATEGORY. DESIGNED TO BEST PRACTICE.

PEDESTRIAN WALKWAYS - AS1158.3.1 2020 PP3

PUBLIC ACTIVITY SPACES - AS1158.3.1 2020 PA3

CONNECTING ELEMENTS - AS1158.3.1 2020 PE2

UPPER GROUND LEVEL & LEVEL 1 - PUBLIC ACCESS

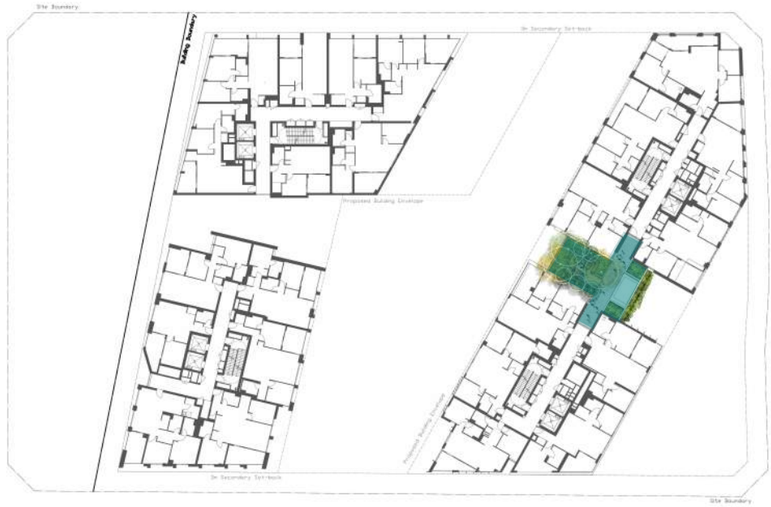
PEDESTRIAN CATEGORY

PRIVATELY OWNED SPACES

LEVEL 2 -
PRIVATE ACCESS

LEVEL 3 -
PRIVATE ACCESS

LEVEL 8 -
PRIVATE ACCESS



LEVEL 9 -
PRIVATE ACCESS

NON- CATEGORY. DESIGNED TO BEST PRACTICE.

PEDESTRIAN WALKWAYS - AS1158.3.1 2020 PP3

PUBLIC ACTIVITY SPACES - AS1158.3.1 2020 PA3

CONNECTING ELEMENTS - AS1158.3.1 2020 PE2

07 OBSTRUSIVE LIGHTING

The following highlighted zones have been selected by JHA and are deemed appropriate for this application.

Final selection of zone to be approved by the client and end-user prior to design development to ensure the effects of outdoor lightng have been applied within this precinct.

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.

TABLE 3.2

MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS

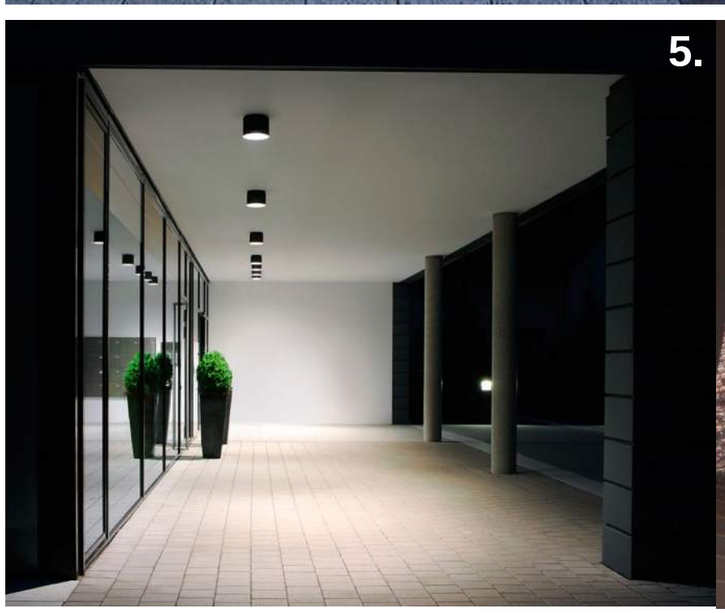
Zones	Vertical illuminance levels (E_v) lx		Threshold increment (TI)		Sky glow
	Non-curfew	Curfew	%	Default adaptation level (L_{ad})	Upward light ratio
A0	See Note 1	0	N/A	N/A	0
A1	2	0.1	N/A	N/A	0
A2	5	1	20%	0.2	0.01
A3	10	2	20%	1	0.02
A4	25	5	20%	5	0.03
TV	See Table 3.4	N/A	20%	10	0.08
V	N/A	4	Note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

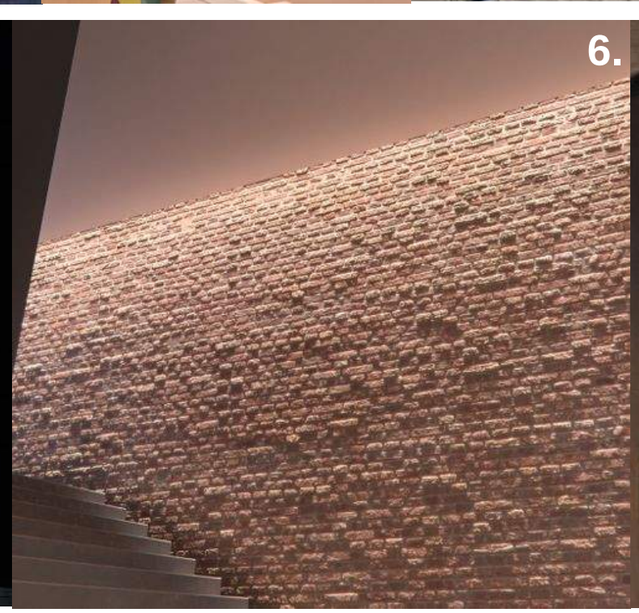
NOTES:

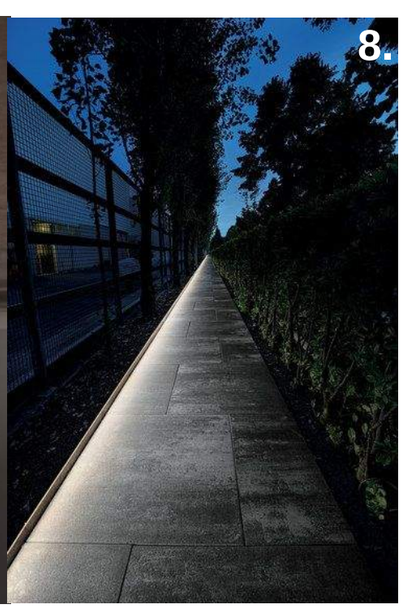
1 For A0, E_v shall be as close to zero as practicable without impacting safety considerations.
2 Refer to AS/NZS 1158.1.1.
3 Refer to AS/NZS 1158.3.1.
4 Refer to AS/NZS 1158.4.
5 N/A means 'Not Applicable'.
6 For an internally illuminated sign in an A2 zone, $L_{ad} \leq 0.25$ cd/m^2.

08 PROPOSED LIGHTING STRATEGY

EXTERNAL PUBLIC SPACES
ASPIRATIONAL IMAGERY



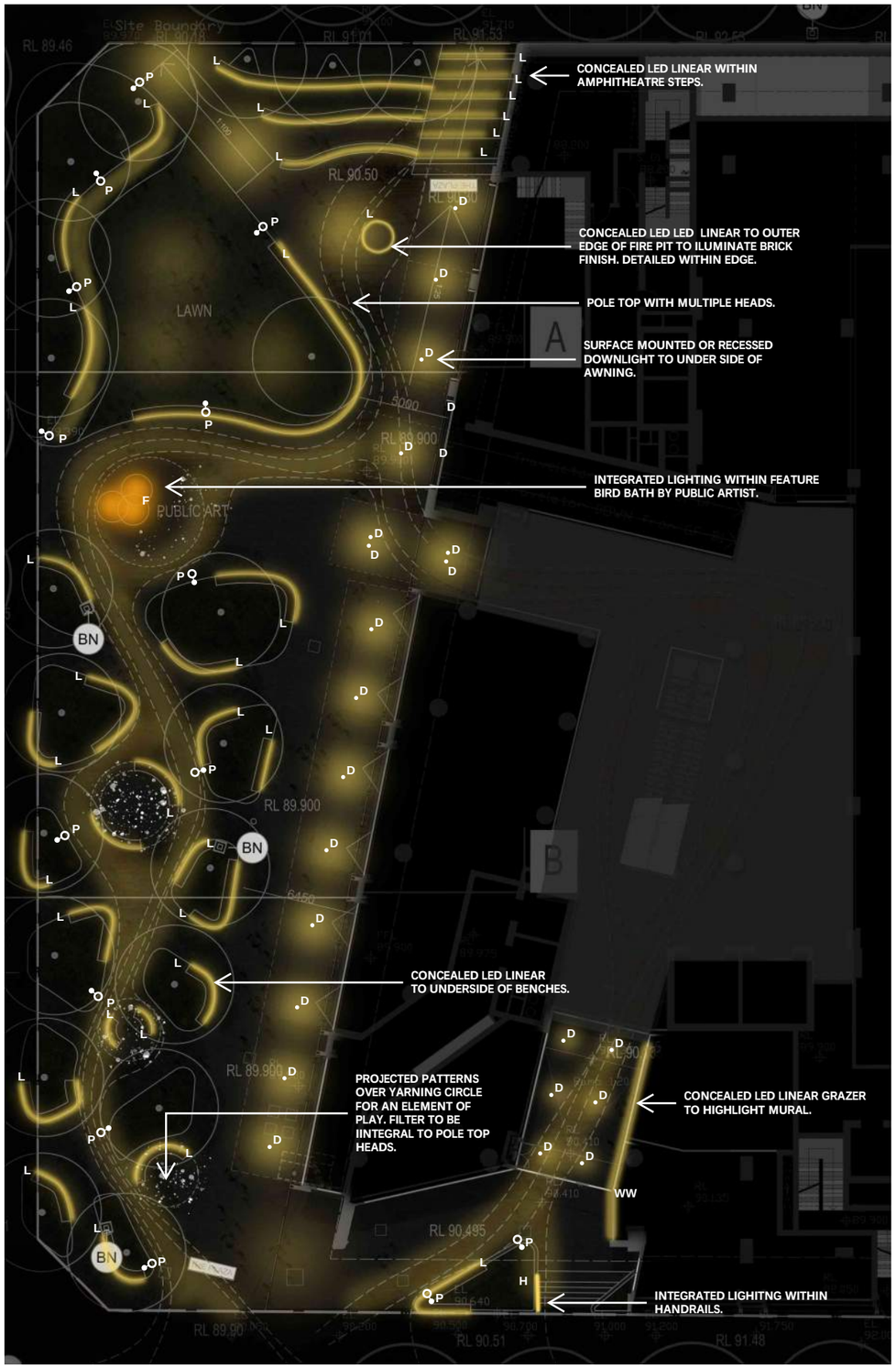




1. Underbench lighting
2. Sculptural pole top luminaires with multiple heads
3. Option to integrate a lens/filter to provide dappled light over yarning circles.
4. Integrated handrail lighting
5. Under awning downlights
6. Concealed LED linear with grazer optic to feature wall.
7. LED linear to highlight columns.
8. Concealed LED with direct distribution to edging/skirting detail. e.g perimeter of fire pit.

PROPOSED LIGHTING STRATEGY

GROUND LEVEL - EXTERNAL



INDICATIVE LUMINAIRE TYPES

P

POLE TOP LUMINAIRES
MULTIPLE HEADS PER POLE.
PATTERNED PROJECTOR FILTER TO BE APPLIED TO SELECT LUMINAIRE HEADS OVER YARNING CIRCLES.

L

FLEXIBLE LED LINEAR
IP RATED WEATHERPROOF LINEAR TO BE CONCEALED WITHIN SEATING, STAIR AND FIRE PIT ELEMENTS.

D

SURFACE MOUNTED DOWNLIGHTS
MOUNTED TO UNDERSIDE OF AWNINGS FOR GENERAL LIGHTING.

WW

LED LINEAR WITH GRAZER OPTICS
CONCEALED LED LINEAR WITHIN CEILING PELMENT OR ELEMENT TO GRAZE DOWN FEATURE MURAL.

H

FLEXIBLE LED LINEAR
INTEGRATED LIGHTING WITHIN HANDRAL TO UNDERSIDE TO HIGHLIGHT STAIR TREADS.

PROPOSED LIGHTING STRATEGY

UPPER GROUND LEVEL & LEVEL 1 - EXTERNAL

* THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR TENDER PURPOSES. QTY'S TO BE VERIFIED IN DD.

INDICATIVE LUMINAIRE TYPES

L

FLEXIBLE LED LINEAR
IP RATED WEATHERPROOF LINEAR TO BE CONCEALED WITHIN SEATING.

D

SURFACE MOUNTED DOWNLIGHTS
MOUNTED TO UNDERSIDE OF AWNINGS FOR GENERAL LIGHTING.

WW

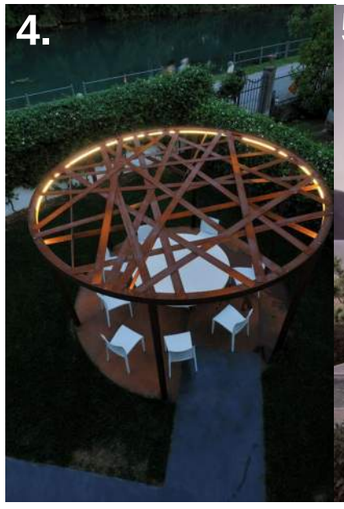
LED LINEAR
SURFACE MOUNTED LINEAR TO UNDERSIDE OF AWNING TO HIGHLIGHT COLUMNS

H

FLEXIBLE LED LINEAR
INTEGRATED LIGHTING WITHIN HANDRAL TO UNDERSIDE TO HIGHLIGHT STAIR TREADS.

09 PROPOSED LIGHTING STRATEGY

PRIVATELY OWNED COMMUNAL SPACES
ASPIRATIONAL IMAGERY



1. Underbench lighting.
2. Surface mounted or recessed downlights to the underside of awnings.
3. Recessed wall lights at low level for safe movement.
4. Integrated lighting within overhead pergola structure.
5. Indirect wall lights at entry points
6. Pole top luminaire over play equipment zone.
7. Surface mounted downlight with direct distribution only.
8. Suspended/strap mounted pendant luminaires to provide dappled light.

PROPOSED LIGHTING STRATEGY

LEVEL 02

INDICATIVE LUMINAIRE TYPES

P

POLE TOP LUMINAIRES
MULTIPLE HEADS PER POLE.
PATTERNED PROJECTOR FILTER TO BE APPLIED TO SELECT LUMINAIRE HEADS OVER YARNING CIRCLES.

L

FLEXIBLE LED LINEAR
IP RATED WEATHERPROOF LINEAR TO BE CONCEALED WITHIN SEATING, STAIR AND FIRE PIT ELEMENTS.

L2

FLEXIBLE LED LINEAR
IP RATED WEATHERPROOF LINEAR TO BE INTEGRATED WITHIN BBQ PERGOLA STRUCTURE.

D

SURFACE MOUNTED DOWNLIGHTS
MOUNTED TO UNDERSIDE OF AWNINGS FOR GENERAL LIGHTING.

W

RECESSED WALL LIGHTS
LOW LEVEL WALL LIGHTS MOUNTED TO SIDE OF PLANTERS.

W2

SURFACE MOUNTED WALL LIGHT
DIRECT DISTRIBUTION ONLY

F2

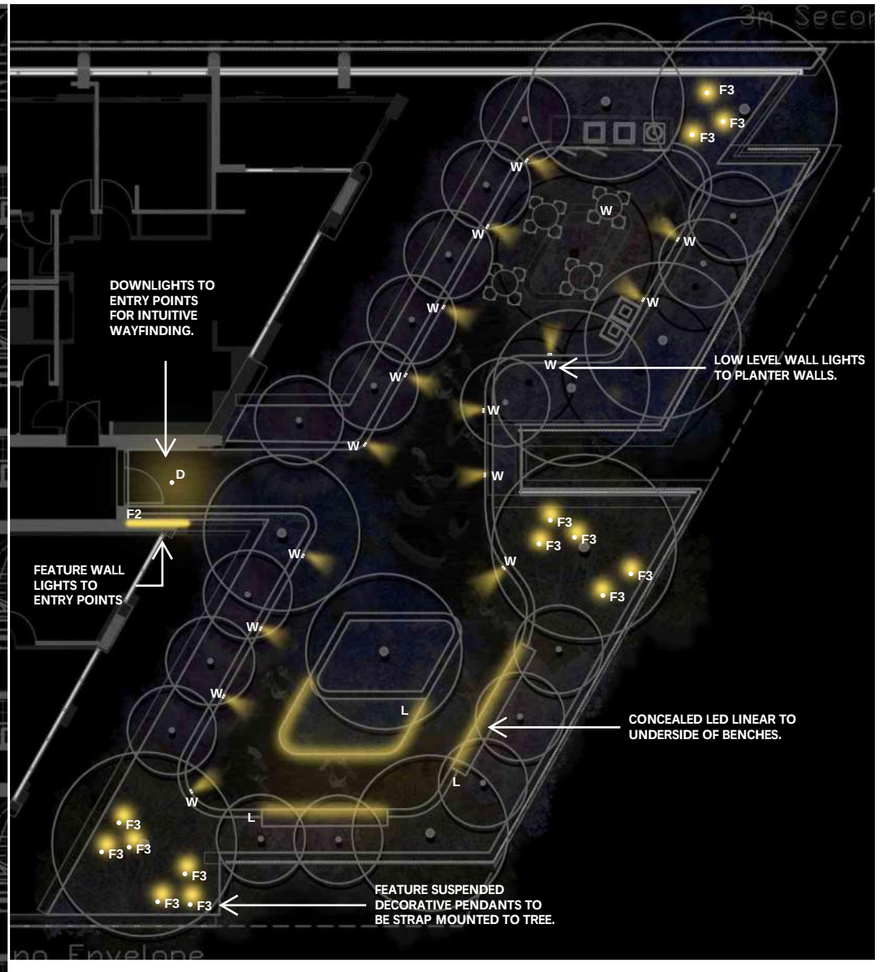
SURFACE MOUNTED WALL LIGHT
DECORATIVE ENTRY MARKERS.
INDIRECT/DIRECT UNDER AWNINGS ONLY.

* THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR TENDER PURPOSES. QTY'S TO BE VERIFIED IN DD.

PROPOSED LIGHTING STRATEGY

LEVEL 03

LEVEL 06



INDICATIVE LUMINAIRE TYPES

L

FLEXIBLE LED LINEAR
IP RATED WEATHERPROOF LINEAR TO BE CONCEALED WITHIN SEATING, STAIR AND FIRE PIT ELEMENTS.

D

SURFACE MOUNTED DOWNLIGHTS
MOUNTED TO UNDERSIDE OF AWNINGS FOR GENERAL LIGHTING.

W

RECESSED WALL LIGHTS
LOW LEVEL WALL LIGHTS MOUNTED TO SIDE OF PLANTERS.

F2

SURFACE MOUNTED WALL LIGHT
DECORATIVE ENTRY MARKERS. INDIRECT/DIRECT UNDER AWNINGS ONLY.

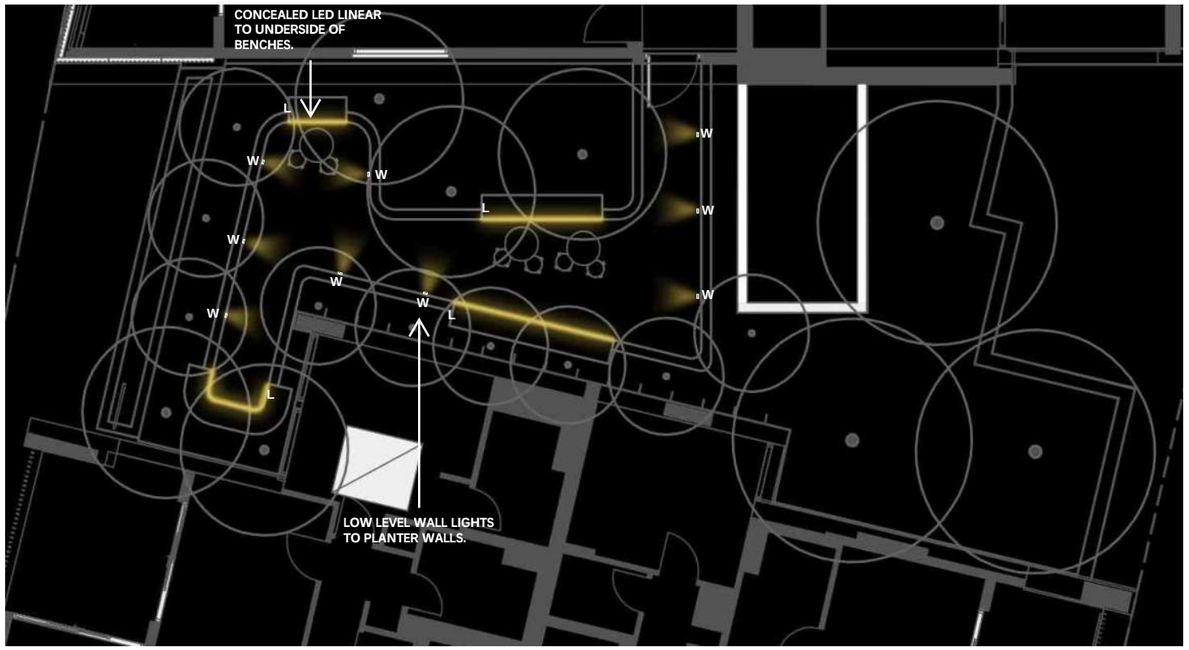
P

SUSPENDED TREE PENDANT
TO BE STRAP MOUNTED TO TREES AT VARYING HEIGHTS.

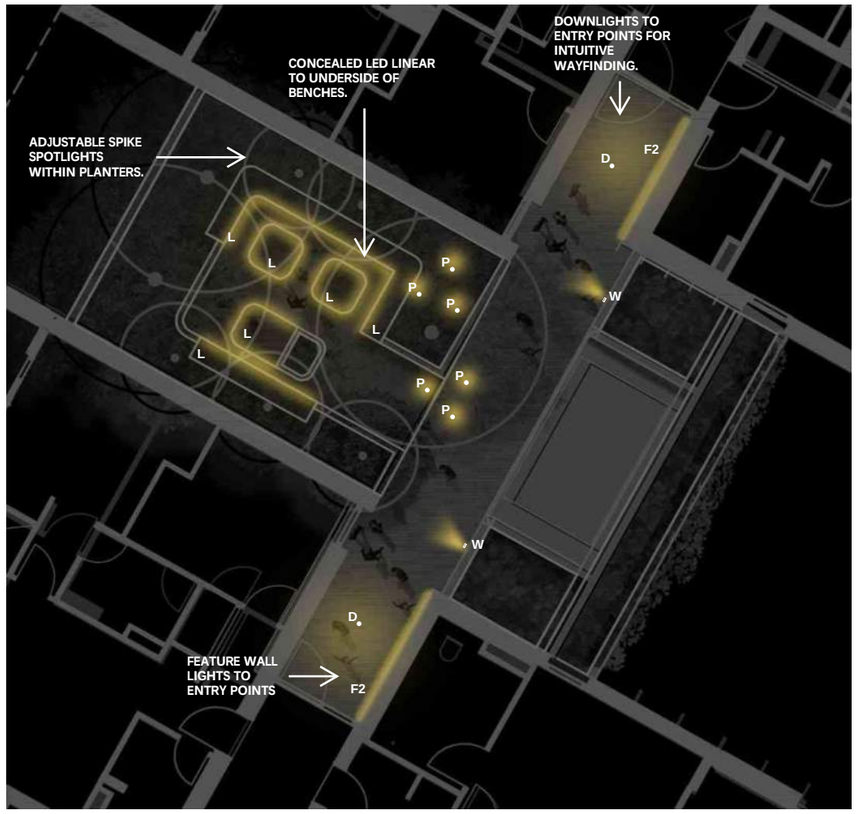
* THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR TENDER PURPOSES. QTY'S TO BE VERIFIED IN DD.

PROPOSED LIGHTING STRATEGY

LEVEL 08



LEVEL 09



INDICATIVE LUMINAIRE TYPES

L

FLEXIBLE LED LINEAR
IP RATED WEATHERPROOF LINEAR TO BE CONCEALED WITHIN SEATING, STAIR AND FIRE PIT ELEMENTS.

D

SURFACE MOUNTED DOWNLIGHTS
MOUNTED TO UNDERSIDE OF AWNINGS FOR GENERAL LIGHTING.

W

RECESSED WALL LIGHTS
LOW LEVEL WALL LIGHTS MOUNTED TO SIDE OF PLANTERS.

F2

SURFACE MOUNTED WALL LIGHT
DECORATIVE ENTRY MARKERS. INDIRECT/DIRECT UNDER AWNINGS ONLY.

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SUSPENDED TREE PENDANT
TO BE STRAP MOUNTED TO TREES AT VARYING HEIGHTS.

* THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR TENDER PURPOSES. QTY'S TO BE VERIFIED IN DD.