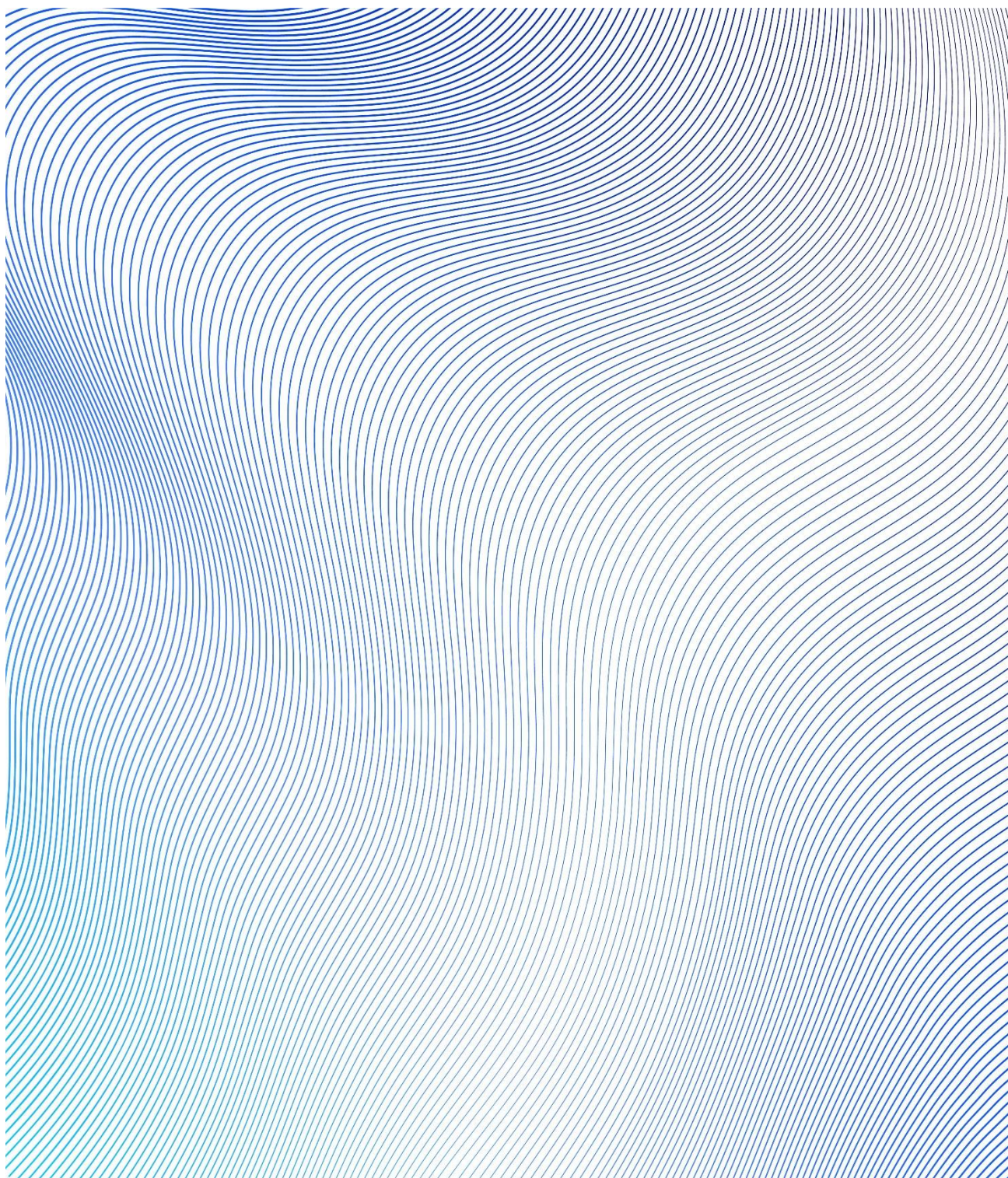


0010443.00 – Tamworth Regional Aquatic Centre

External Lighting Strategy Report



0010443.000 – External Lighting Strategy Report

Issue	Description	Date (DD.MM.YY)	Prepared By	Signed Off
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V1.0

Executive Summary

This report addresses the key external lighting design considerations and parameters associated with the Tamworth Regional Aquatic Centre (TRAC).

This report supports the Development Application for the Tamworth Regional Aquatic Centre located to the West of the Tamworth Regional Hockey Centre on Jack Smyth Drive, Tamworth, NSW 2340. The TRAC includes an indoor 50m swimming pool facility, 25m WWP, gymnastic facility, amenities, community space and carpark area.

Tamworth Council is the proponent for the Development Application.

Table of Contents

Executive Summary 3

Introduction 6

Design Criteria 8

Control of Obtrusive Effects of Outdoor Lighting 9

External Lighting Assesment 11

Lighting Strategy 16

Appendix A Outdoor Lighting Categories / Sub-Categories 17

Appendix B Area of Work Assessed Sub-categories 18

List of Tables

Table 1: Assessment Summary – Pedestrian/Cyclist pathway12

Table 2: Assessment Summary – General Circulation12

Table 3: Assessment Summary – Disabled Carpark12

Table 4: Assessment Summary – Pedestrian Crossing in Carpark.....13

List of Figures

Figure 1 Aerial photograph of the site 6

Introduction

1.1 General

This Design Report, prepared by Introba supports Development Applications for the development of the Tamworth Regional Aquatic Centre located to the West of the Tamworth Regional Hockey Centre on Jack Smyth Drive, Tamworth, NSW 2340. The TRAC is a new indoor swimming pool facility, gymnastic facility, amenities, community space and with carpark area. Tamworth Council is the proponent for the DA.

The purpose of this report is to capture Introba's procedural-based assessment of a suitable external lighting strategy for the TRAC development compliant with relevant Australian Standards, National Construction Code, and applicable guidelines.

A summary of scope, design criteria, design options considered (where applicable) is provided in our assessment along with recommendations on key design strategies or options to be adopted during design development.

1.2 Site Description

The subject site is located to the West of the Tamworth Regional Hockey Centre on Jack Smyth Drive, Tamworth, NSW 2340 as highlighted in Figure 1.

The site has a primary frontage to Jack Smyth Drive to the south, a secondary frontage to Longyard Drive to the north and a Hockey Centre to the east.

The surrounding context of the site is predominately low and medium density sports centres. The site is surrounded by a Gymnastic club and Entertainment centre to the north-east, Hockey Centre to the east, and a basketball centre to the south. The closest residential area is located 200m away to the south-west of the site.



Figure 1 Aerial photograph of the site

1.3 Overview Of Proposed Development

The Tamworth Regional Aquatic Centre Development Application which seeks consent for the construction and use, including:

TRAC (Stage 1)

- 10 Lanes 50M Indoor pool with moveable swim wall and floor.
- Indoor Spectator stands Seating for up to 600 people.
- 25M Warm water/Program pool.
- Administration, offices and first aid.
- Foyer, reception, and café.
- Wet and dry lounge
- Gym, strength and cardio
- Allied health consulting rooms x4.
- Health and fitness rooms x2
- Crèche
- Services plant room and stores
- Off street carpark (158 total spaces including 6 accessible spaces) accessed via Jack Smyth Drive.
- Off street carpark (30 total staff spaces including 2 accessible spaces) accessed via Longyard Drive.
- Public domain works within the site, including new landscaping and tree planting.

NICSH (Stage 1)

- Sports science testing lab.
- Administration/sports house.
- Teaching and meeting spaces.
- Reception and accessible amenities.

This report is covering only stage 1 and will not make allowances for the future stages 2 and 3 as confirmed by CO.OP and Tamworth Council.

This document has been prepared based on the architectural drawings received from CO.OP Studio, and the services workshops held with CO.OP Studio to date.

Full details of the proposed development are included in the Architectural Drawings prepared by CO.OP Studio which accompany the Development Application.

Design Criteria

External lighting will be provided around the aquatic centre, car parking, pedestrian and vehicular circulation areas of the facility to provide a safe and welcoming environment for users of the facility and the general public, with consideration given to:

- Safe movement of pedestrians, cyclists, and vehicles,
- Integration with the architectural design intent and to compliment the overall aesthetics of the building and surrounds,
- Minimisation of obtrusive light spill and glare to surrounding properties and the public domain,
- Minimise the impact of external lighting on wildlife,
- Security lighting,
- Application of the Crime Prevention through Environmental Design (CPTED) strategy.

1.4 Standards and Guidelines

External lighting will be designed according to the following standards and guidelines:

Standards	
AS/NZS 1158.3.1:2020	Lighting for Roads and Public Spaces – Part 3.1: Pedestrian Area (Category P) Lighting – Performance and Design Requirements
AS/NZS 2560.2.5:2007	Lighting for swimming pools and immediate surroundings
AS/NZS 4282:2023	Control of the Obtrusive Effects of Outdoor Lighting
NCC 2022	National Construction Code of Australia 2022

Control of Obtrusive Effects of Outdoor Lighting

1.5 Environmental zone

While the site is located in the Sydney Metropolitan Area, to assist in achieving the design aesthetic and for the purposes of light spill management, the site has been assigned the following environmental zone (AS/NZS 4282:2023 Table 3.1):

Zone	Description	Examples
A3	Medium District Brightness	Suburban Areas in Towns and Cities

The following maximum values of light technical parameters are applicable (AS/NZS 4282:2023 Table 3.2):

Zone	Vertical Illuminance levels (E_v) lx		Threshold Increment (TI)		Sky Glow
	Non-curfew	Curfew	%	Default Adoption Level (L_{ad})	Upward Light Ratio
A3	10	2	20%	1	0.02

The following maximum luminous intensities per luminaire are applicable (AS/NZS 4282:2023 Table 3.3):

Zone	Luminous Intensity (I), cd		
	Non-curfew L1	Non-curfew L2	Curfew
A3	12500	25000	2500

The following maximum average luminance of surfaces (AS/NZS 4282:2023 Table 3.5):

Zone	Luminance of Surfaces, cd/m ²
A3	250

1.6 Potential obtrusive effects

With regards to obtrusive lighting, the following aspects have been identified for consideration during design development: -

1.6.1 Adjacent Properties

Residential properties are located 200m away from the Aquatic centre to the Northern side of the Longyard Drive and 200m from the south-west side of the Jack Smyth Drive. The light spill impact from the facility entrance and car park area is anticipated to be negligible and will be assessed at the property boundary in accordance with AS/NZS-4282 requirements.

1.6.2 Effects on Transport System Users

The design intent is to minimise the impact of the light spill on traffic travelling south bound along Jack Smyth Drive and northwest bound along Longyard Drive. This shall be achieved by selection of appropriate light distribution optics and positioning of poles in such a manner to mitigate potential light spill onto adjacent traffic and road users.

1.6.3 Effects on Wildlife

The design intention is to minimise the effect of external lighting on the wildlife by considering and implementing below: -

- Minimise the intensity of lighting to the minimum required to comply with standards as far as practical.
- Minimise the intensity of lighting by switching to a reduced lighting design category when the facility is unoccupied or in use by maintenance staff only.
- Minimise the duration of light by turning off site lighting when not required for access or security purposes.

1.6.4 Effects on Astronomical Observations

The design intention is to minimise the impact of the light spill on observatory facilities.

Nearby observatories were identified from the Astronomical Society of Australia list of designated observatories (review 6/9/2019).

- Anglo-Australian Telescope – 176km
- Australia Telescope Compact Array – 157km
- Macquarie University – 395km
- Bagnall Beach Observatory – 210km
- Crago Observatory – 271km
- Green Point Observatory – 320km
- Grove Creek Observatory – 333km
- iTelescope.Net – 176km
- Sydney Observatory – 304km
- Penrith Observatory – 292km

As the site is distant from above mentioned sites and the environmental category A3 for upward light ratio is minimal (0.02), it is not anticipated the development will have an impact on the observatories.

External Lighting Assessment

1.7 Area of Work Category

The proposed development has been assessed as comprising the area / activity types described within the below standards;

- AS/NZS 1158.3.1:2020
 - Table 2.2 – pedestrian / cycle activity
 - Table 2.5 – outdoor car parks
 - Table 3.5 – Lit Surfaces

Please refer to Appendix A, which provides a summary of categories and subcategories for roads and public space type areas, with the applicable areas for the development highlighted.

Please refer to Appendix B for a plan view of the site, indicating the extents of the various lighting subcategories identified within this assessment.

1.8 Sub-Category Selection

The level of activity and fear of crime is considered in the sub-category selection to determine an applicable lighting subcategory, which determines the light technical parameters for the area.

1.8.1 Pedestrian/Cyclist Pathway and Outdoor carpark

Level of activity has been assessed as Medium in the sub-category selection.

For Fear of Crime, the selection criteria is considered Low level for the lighting subcategory determination.

Table 2.2 and 2.5 subcategory definitions as per AS/NZS 1158.3.1:2020 is provided below.

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

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

1	2	3	4
Type of area	Selection criteria ^{a,c}		
	Night time vehicle and/or pedestrian movements	Fear of crime	Applicable lighting subcategory ^b
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

Summary of subcategory assessment is provided below: -

Category	Classification
Type of Road or Pathway	Pedestrian or cycle-oriented pathway
Basic Operation Characteristics	Pedestrian/cycle traffic only
Pedestrian/ Cycle Activity	Medium
Fear of Crime	Medium
Applicable Lighting Subcategory	PP3

Table 1: Assessment Summary – Pedestrian/Cyclist pathway

Category	Classification
Type of Area in Carpark	Parking spaces, aisles and circulation roadways
Night-time Vehicle and/or Pedestrian Movements	Low
Fear of Crime	Medium
Applicable Lighting Subcategory	PC2

Table 2: Assessment Summary – General Circulation

Category	Classification
Type of Area in Carpark	Designated parking spaces specifically intended for people with disabilities
Night-time Vehicle and/or Pedestrian Movements	N/A
Fear of Crime	N/A
Applicable Lighting Subcategory	PCD

Table 3: Assessment Summary – Disabled Carpark

Category	Classification
Type of Area in Carpark	Any designated areas for pedestrian to cross
Night-time Vehicle and/or Pedestrian Movements	N/A
Fear of Crime	N/A
Applicable Lighting Subcategory	PCX

Table 4: Assessment Summary – Pedestrian Crossing in Carpark

1.9 Light Technical Parameters (LTP) – Pedestrian/Cyclist pathway & Carpark

Computer aided lighting design to comply with Light Technical parameters set out in AS1158.3.1:2020 Table 3.4 and 3.7 for footpath and carpark sections respectively will be completed during development to ensure compliance is achieved.

Summary of Light Technical Parameters definition is provided below:

LIGHT TECHNICAL PARAMETERS (LTP)

Parameter	Symbol
Average horizontal illuminance	$\bar{E}_h$
Point horizontal illuminance	E_{ph}
Illuminance uniformity Category P	U_{E2}
Point vertical illuminance	E_{pv}

Further assessment of Maintenance of Light Technical Parameters by considering two main aspects of Luminaire Dirt Depreciation Factor (LDD) provided in the table below is equal to 0.9 for 36 months cleaning frequency, and Luminaire Source Lumen Depreciation (LLD) of 0.8 which is standard across LED type light source is considered for the system overall Light Loss Factor (LLF).

LDD FACTORS

Environmental zone	LDD factor			
	Cleaning frequency			
	36 months	48 months	60 months	72 months
Rural	0.95	0.94	0.93	0.92
Urban	0.90	0.88	0.86	0.84

In accordance with section 3.5.5 of AS1158.3.1:2020, the overall LLF of 0.7 will be considered.

1.9.1 Pedestrians and cyclist path - LTP

The development will comply with Light Technical Parameters set in AS1158.3.1:2020 Table 3.4. Refer below for summary of design criteria to achieve in order to obtain compliance.

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.

NOTES:

- Validation of the values in Columns 2 to 5 is by calculation, not field measurement. This is particularly relevant to small values in Columns 2, 3 and 5, which will typically be difficult to validate by field measurements.
- See Section 4 for the design methods and requirements for use in assessing conformance to the specified light technical parameters.

1.9.2 Carpark - LTP

The development will comply with Light Technical Parameters set in Table 3.7 of AS/NZS 4282:2023. refer below for summary of design criteria to achieve in order to obtain compliance.

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 ^{a,b} ($\bar{E}_h$)	Point horizontal illuminance ^{a,b} (E_{ph})	Illuminance (horizontal) uniformity ^c Cat. P (U_{E2})	Point vertical illuminance ^{a,b} (E_{pv})
	lx	lx		lx
PC1	14	3	8	3
PC2	7	1.5	8	1
PC3	3.5	0.7	8	—
PCD ^d	—	≥ 14 and $\geq (\bar{E}_h)^d$	—	—
PCX ^e	21	5	8	—

1.10 Externally illuminated surfaces

The development will comply to the maximum average luminance of the facades and should not be greater than the limits set in Table 3.5 of AS/NZS 4282:2023.

TABLE 3.5
MAXIMUM AVERAGE LUMINANCE
OF SURFACES (cd/m²)

Application conditions	Environmental zones				
	A0	A1	A2	A3	A4
See Clause 3.3.5.4	0.1	0.1	150	250	350

Lighting Strategy

The facility will be used during normal business hours as well at night. The external lighting to the carpark and walkways will be adapted to suit with means of adjustable/programmable control to suit the site's operations. It is anticipated that the lighting system will operate from dusk till dawn.

The lighting system will utilise a combination of post-top, bollard, recessed location, façade mounted and pathway illumination type luminaires to achieve the design intent and comply with the relevant requirements.

Pole mounted luminaires shall be 5-8 metre high and shall have adjustable mounting brackets to properly aim the luminaires' light distribution (to be detailed during design development).

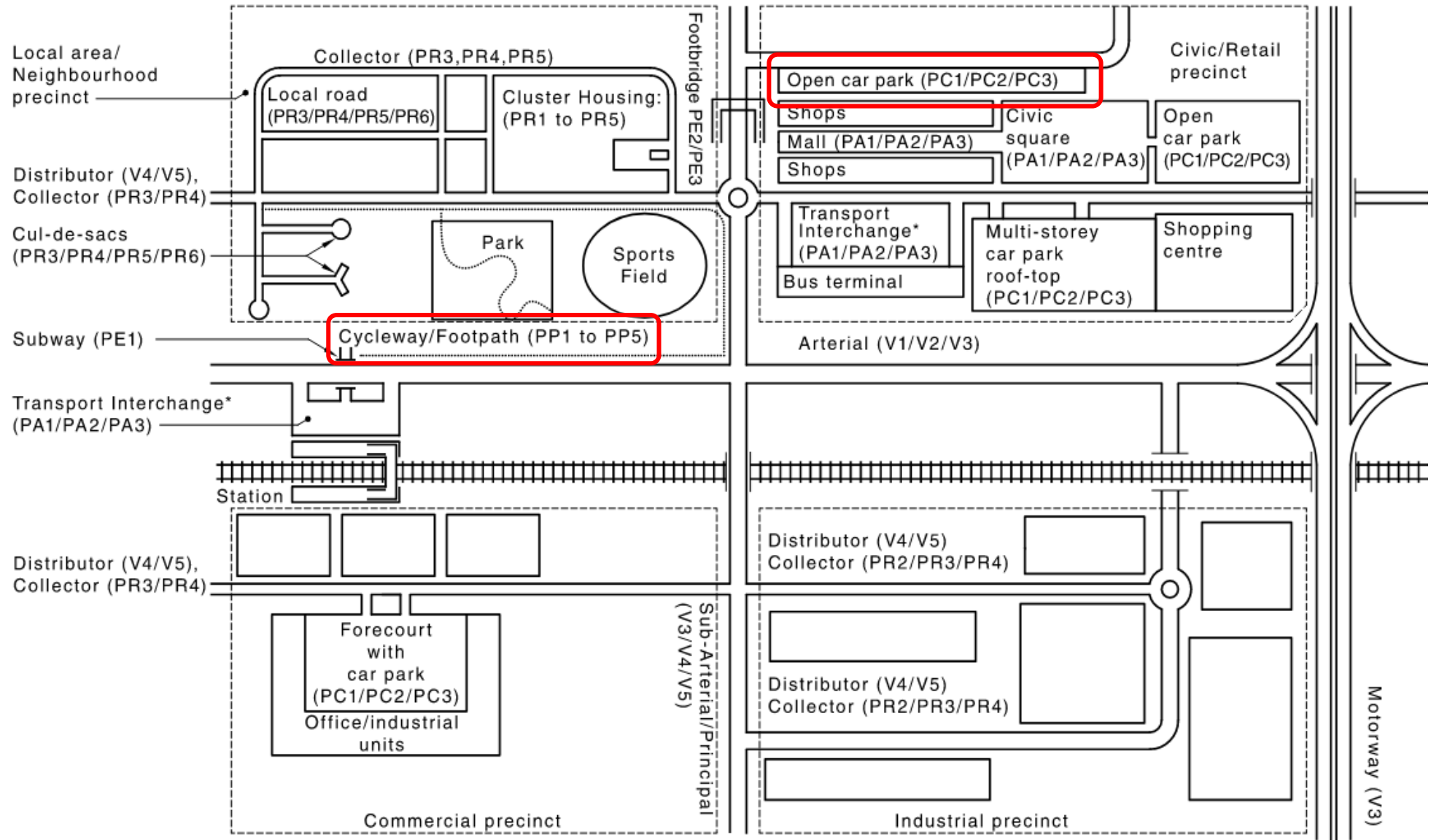
Luminaire selections shall generally incorporate the following: -

- High Impact Resistance - IK10
- High Ingress Protection Rating – IP66
- Light source to be LED
- Forward and side light distribution optics
- Colour Rendering Index of greater than 80
- Colour Temperature of 4000K
- Compatible with DALI Lighting Control System
- Low-cut-off, Aero screen style casing to minimise upward light spill

1.11 Switching and control

The site switching and control strategy will utilise a flexible DALI programmable control system that can be adjusted to meet changing requirements for community use. The main use of the site lighting will be from dusk and dawn to ensure safe community access and use and will be switched using a timeclock/photoelectric cell with manual override. Lighting provided for security purposes will operate between dusk and dawn.

Appendix A Outdoor Lighting Categories / Sub-Categories



Appendix B Area of Work Assessed Sub-categories

