External Lighting Strategy Report

RIDBC
Centre of Excellence

Revision P2

2nd October 2020

Revision Information

Project	Royal Instituted for Deaf & Blind Children (RIDBC) Centre of Excellence
Title	External Lighting Strategy Report
Client	RIDBC
Revision	P2
Revision Date	2/10/2020
Prepared By	LCI Consultants Sydney Office Level 4 73 Walker Street North Sydney 2060
Author	Carter Leung

Revision Schedule

Revision	Date	Issue Name	Author	Authorised
P1	29/9/2020	Preliminary Issue	Carter Leung	Shi-En Lim
P2	2/10/2020	Preliminary Issue	Carter Leung	Shi-En Lim

Contents

1 Executive summary

The RIDBC is Australia's largest non-government not-for-profit provider of therapy, education and cochlear implant services for children and adults with vision or hearing loss. Established in 1861 as a school with residential facilities, the RIDBC moved to North Rocks in 1961, where the main campus is still located. The RIDBC Mission is to provide quality and innovative services, to achieve the best outcomes for current and future generations of Australians with vision and/or hearing loss.

RIDBC provides a broad range of specialist services which include:

- Early Intervention;
- Allied Health & Therapy;
- Cochlear Implant Program;
- Schools (pre-school, primary to secondary programs);
- Research & Professional Education;
- School support; and
- Paediatric Audiology

The services provided are delivered by a broad group of professionals including: teachers, speech pathologists, occupational therapists, audiologists, orthoptists, psychologists, social workers, technology consultants, physiotherapists, Ear, Nose and Throat (ENT) surgeons and more.

As part of the RIDBC's 2016-2020 Strategic Intent it will relocate its school and clinical services activities from North Rocks to a purpose-built centre at Macquarie University (MQU). The new Centre of Excellence will further strengthen the relationship between MQU and the RIDBC, benefit the Australian Hearing Hub, and reinforce the cluster of research, audiology, and healthcare which already exists on the campus, which also includes the Cochlear Global headquarters.

The Centre of Excellence will serve a diverse range of employees, students, users and visitors who will visit the centre for diagnostic services, therapy and rehabilitation, research, education, and co-related services. The centre will provide an intricate design response to the needs of the users, in particular children and adults with vision and hearing loss and other cognitive impairments.

2 Introduction

With the new RIDBC building proposal, a lighting design strategy will be required to allow for afterhours access and circulation lighting in overcast condition. As the site is close to student accommodations and an existing observatory, a plan is required to minimise and mitigate any potential obtrusive lighting to the neighbouring properties and into the night sky. The lighting design must:

- Helps accentuate the outdoor environment
- Complies with all relevant lighting Australian Standards
- Provides safety access around the site perimeter, in line with the CPTED assessment
- Have measures in place to mitigate obtrusive lighting that may affect the Macquarie University Observatory and other neighbouring properties

This report provides a high level lighting strategy, outlining:

- Lighting design parameters based on the usage of the site afterhours
- Potential lighting design strategy to achieve the parameters and accommodate the aesthetic and security requirements of the project
- Measures in place to reduce potential lighting obtrusive to the surroundings
- Mitigation of upward spill light to ensure the development has minimal effect to the operation of the nearby observatory

3 Background

As part of RIDBC's mission, the proposed site has been identified and acquired within the Macquarie University (MQU) grounds, from which RIDBC intend to develop a bespoke Centre of Excellence that will allow them to consolidate their existing campus facility and relocate to by the end of 2022. The location at Macquarie Park will allow RIDBC to leverage upon nearby transport, hotels and other university and other facilities, including the Australian Hearing Hub(which RIDBC have an affiliation with) that shall allow RIDBC to continue to integrate and collaborate with MQU.

4 Site Description

RIDBC Centre of Excellence is located within Macquarie University. Situated northwest of Sydney, the school is approximately 15km from Sydney CBD. The new RIDBC Buildings will be located:

- At Latitude: -33.7717318 and Longitude: 151.109510, near the intersection of Culloden and Gymnasium Road at Macquarie Park
- The RIDBC property borders:
    - Gymnasium Road – a minor road on the eastern side of the property
    - Culloden Road – a minor road on the northern side of the property
    - West Precinct Road – a minor road on the southern side of the property
    - Macquarie University Carpark (P5) – on the western side of the property

The proposed site is surrounded by predominantly residential uses. The locational context of the school is illustrated at **Figure 1**. **Figure 2** provides an aerial map of the school and its immediate surround.

The proposed development generally seeks consent for the construction and operation of the new purpose-built 1-3 storey (including basement level) Centre of Excellence across two interconnected pavilions at the corner of Culloden and Gymnasium Road within the MQU Campus. The development includes:

- Pre-School and School accommodation for up to 80 pre-school children and up to 120 school children in a single-storey pavilion addressing Culloden Road; and
- The main RIDBC building (accommodating approximately 260 staff) of up to three storeys, including basement level:
    - Public areas for staff and visitors;
    - RIDBC Renwick Centre classrooms (doubling also as conferencing facilities) and a business hub;
    - Medical Facility for various clinical services; and
    - RIDBC Renwick Centre resource centre; use between RIDBC Renwick Centre staff, clinicians and pre-school / primary school teaching staff.

In accordance with Schedule 1 (clause 15(1)) of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP), the development qualifies as State Significant Development (SSD) as it is a *development for the purpose of a new school (regardless of the capital investment value)*.

Within the school campus, the site of this SSDA is illustrated in **Figure 3**. The single storey school facility is shown as blue, while the three storeys main RIDBC building is shown in orange.

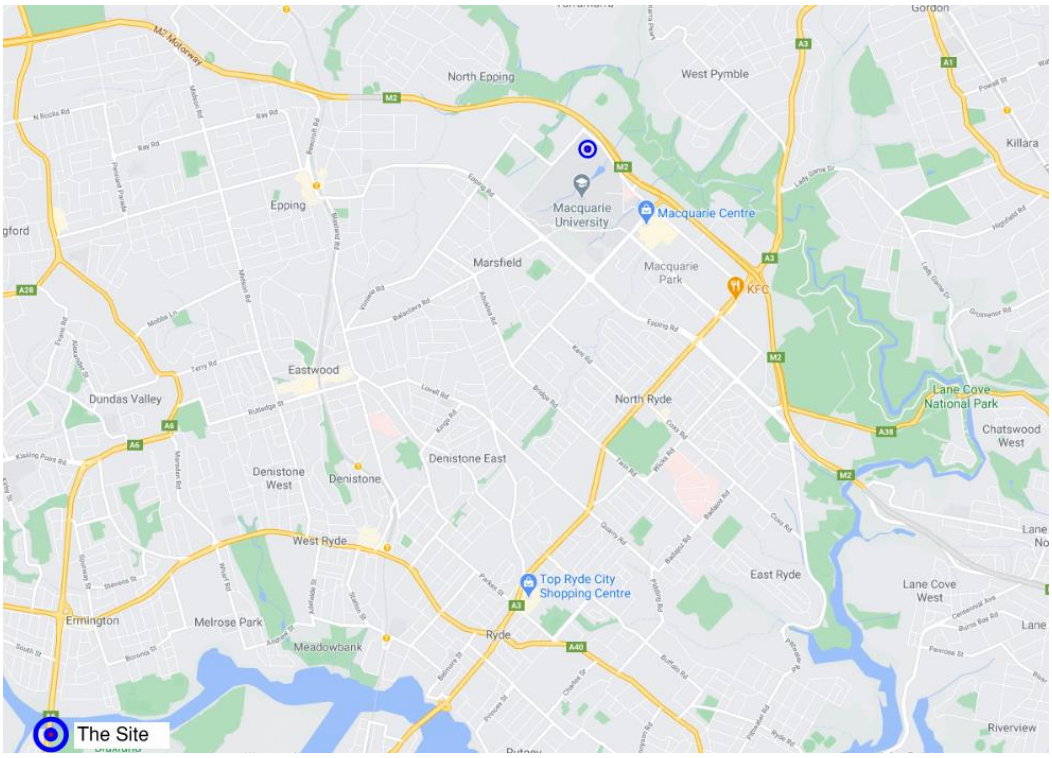


Figure 1 – RIDBC Centre of Excellence Location Context Plan

Source: Google Maps, edited by LCI

Figure 2 – Aerial Map of the proposed RIDBC Centre of Excellence location

Source: Google Maps, edited by LCI

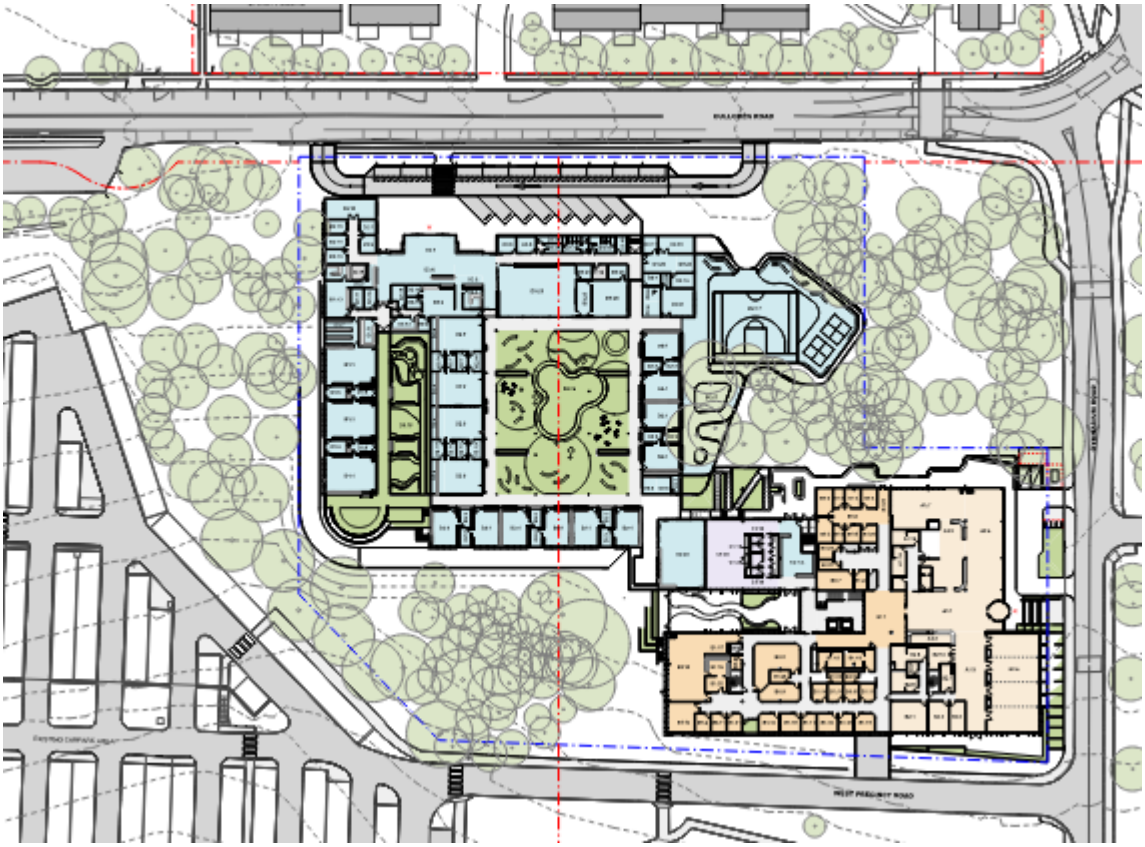


Figure 3 – Project Scope
Source: WMK Architecture

5 Design criteria

External lighting will be provided around the building entry and perimeter pathways to provide a safe environment for users of the facility afterhours. While the normal school hours operate between 8:30am and 4:00pm, long day care hours are being considered and the school may operate till 6pm. The site is still accessible by staffs and cleaners afterhours, the final time still under determination. The outdoor learning space will be closed from usage afterhours and only allowed for circulation.

Lighting design must be provided, with consideration given to:

- safe movements of pedestrians
- 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
- security lighting
- application of the Crime Prevention through Environmental Design (CPTED) strategy

5.1 Standards and guidelines

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

Standards	
AS/NZS 1158.3.1	Lighting for roads and public spaces Part 3.1: Pedestrian area (Category P) lighting – performance and design requirements
AS 4282	Control of the obtrusive effects of outdoor lighting
Dark Sky Planning Guideline	Lighting Guideline for Facility near Siding Spring Observatory While the development is not near this particular observatory, the design principles as outlined in this guideline will be used as references to mitigate and reduce lighting effect to the MQU Observatory nearby

Refer to **Section 8** for the proposed lighting design parameters and the relevant Australian Standards classifications, based on the anticipated usage and perceived fear of crime around the area.

5.2 Light spill

A light spill assessment to AS 4282 will be completed as part of the detailed design. Preliminary investigation into light spill has identified the following factors:

Effects on residential properties

The closet residential properties are identified as the Macquarie University student accommodation located at 122 Culloden Road (double levels, multi-building development, located directly opposite to the main entrance of the RIDBC site).

Macquarie University Observatory

With MQU Observatory within close proximity to the site, obtrusive lighting to the night sky must be mitigated. The lighting design will use the Dark Shy Planning Guideline as reference and employ the following lighting strategy as outlined in the Guideline:

- Uplighting is to be avoided
- Glare shield/snoot are to be incorporated to the luminaire design where required
- Warm colour lamp colour temperature to be used in the outdoor environment
- Exterior lighting will be controlled and automatically turned off afterhours

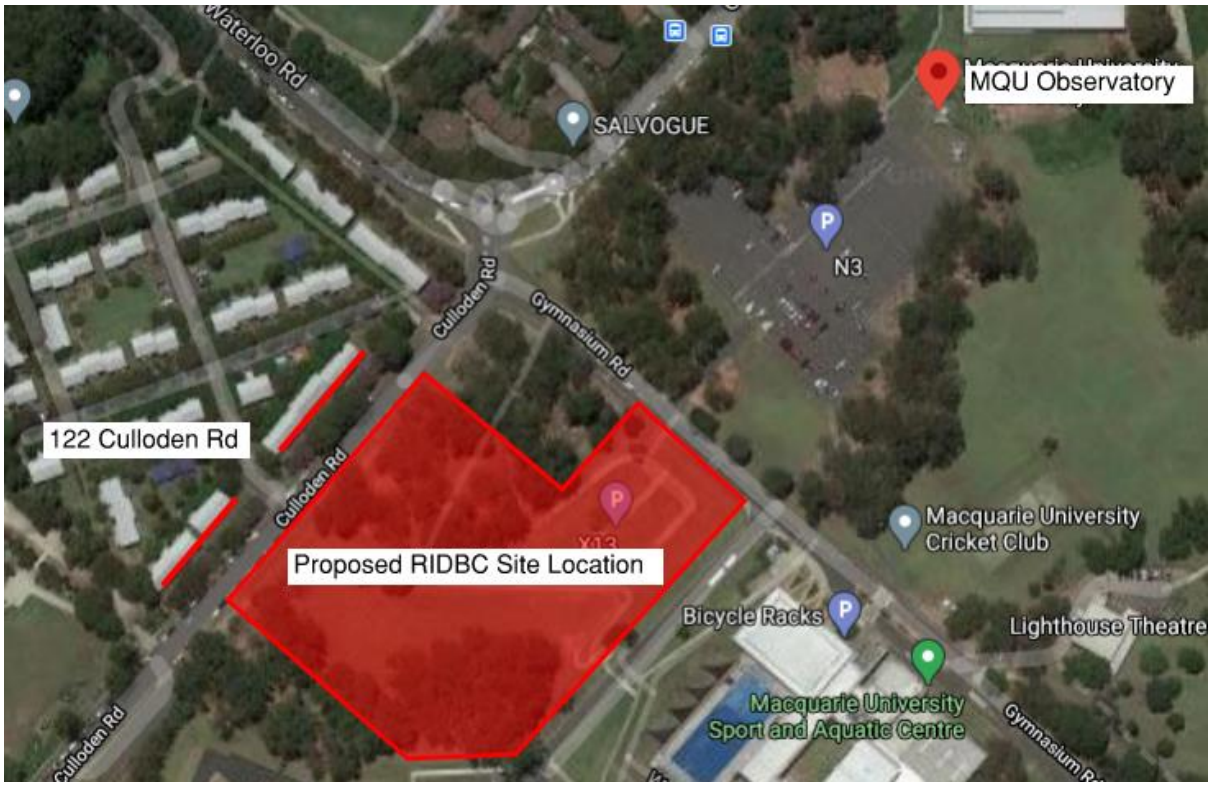
Refer to **Section 7** of the report the proposed methods and strategy to minimise and mitigate the impact of lighting to the MQU Observatory.

Other properties

Other than the residential property at 122 Culloden Road and MQU Observatory, the only building within close proximity to the RIDBC site is the Macquarie University Sport and Aquatic Centre, which operates between 6am to 8pm daily. The centre is more than 45 away and there will be limited obtrusive lighting effect to the building.

Effects on transport system users

Selection and placement of luminaires will be designed to minimise the impact on traffic travelling along Culloden Road.



6 Lighting strategy

External lighting will adopt the following strategy:

6.1 General approach

The lighting design will aim to provide a safe environment that compliments the building, while ensuring the new development has minimum obtrusive effect to the neighbouring properties.

Generally the external lighting will be timeclock controlled, design to the minimum requirement for safety. The school entrance and consultancy building porte cochere are proposed to be dimmable. Under normal operation, the lighting level are to be dimmed to satisfy the security requirement. During events where the buildings maybe occupied for extended hours, the entrance lighting should have the capability to increase in intensity to provide a more vibrant and welcoming environment.

Where possible, accent lighting would be incorporated as part of the circulating lighting strategy, providing both aesthetically and functionally to the space.

Image 1: School Entrance – Early Evening

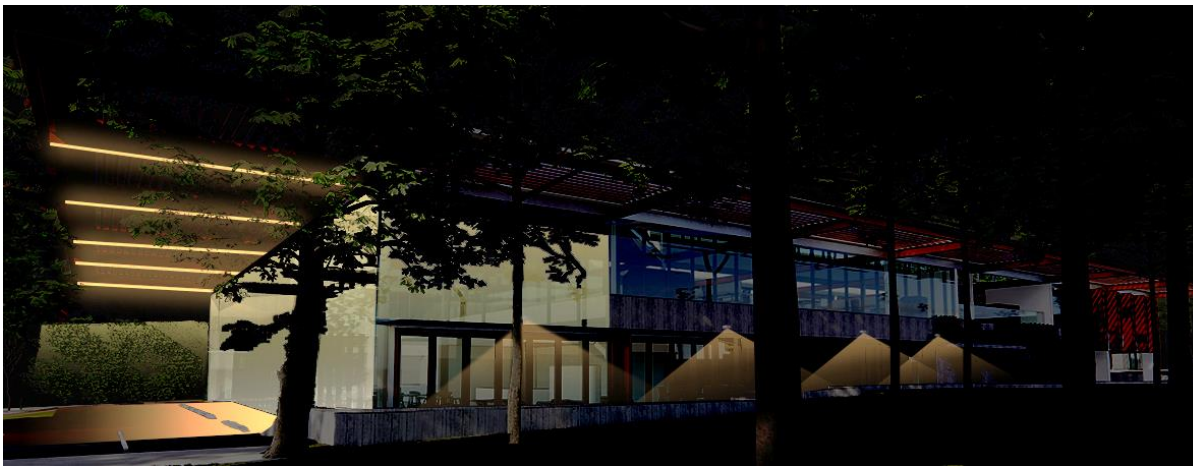
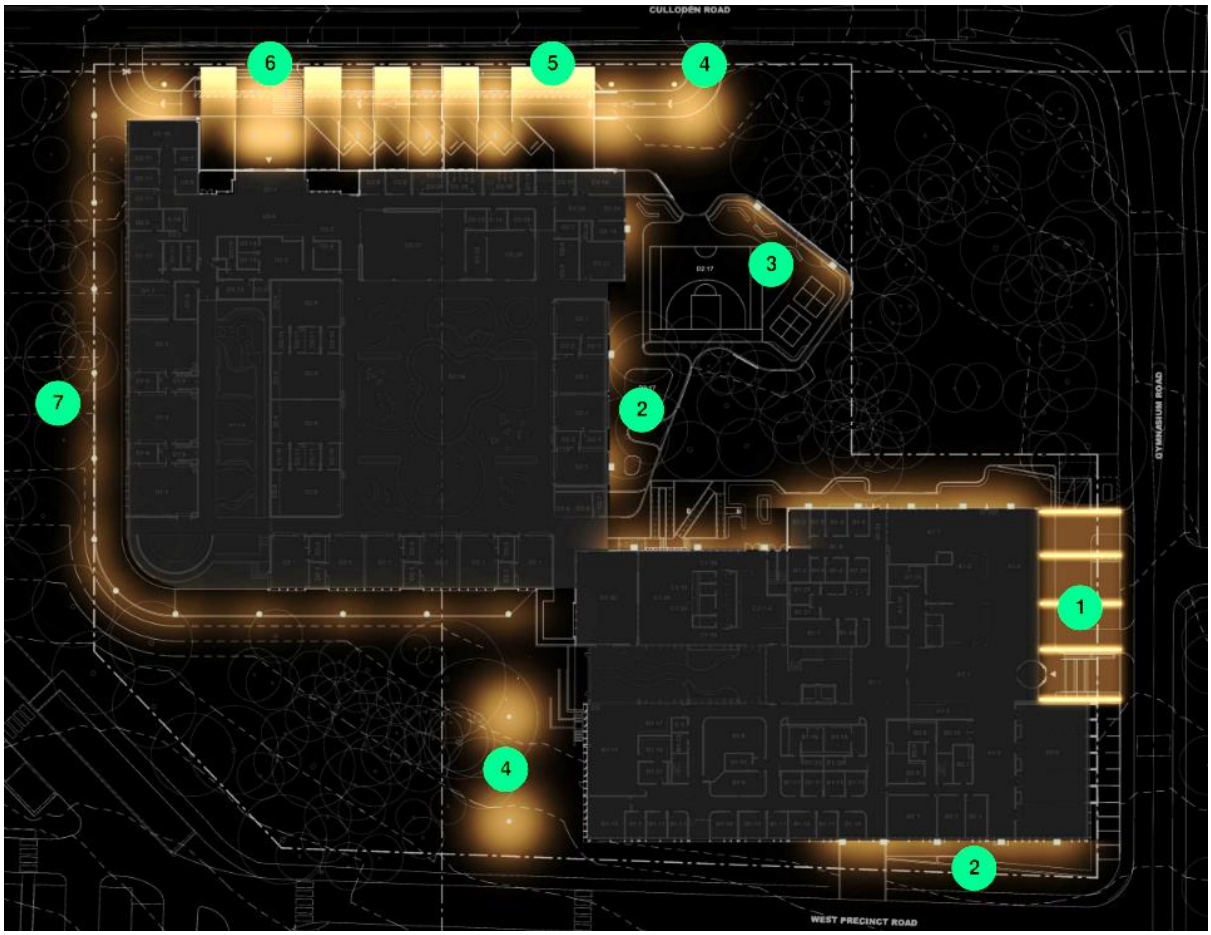


Image 2: Admin & Clinical Building Porte Cochere – Early Evening

6.2 Indicative Lighting Plan & General Luminaire Types



Luminaires will be selected during detailed design. The light source will be high-quality, efficient LED type to minimise energy consumption. A warm white colour temperature (3000K) will be adopted across the facility for external lighting in circulation area to provide a warm, welcoming environment.

To minimise light spill, luminaires will generally be low-cutoff, aeroscreen style to minimise uplight.

(1) LED Extrusion. Downward only. To be installed below I-beams

(2) Wall mounted LED luminaire

(3) Fence mounted LED luminaire

(4) Pole mounted luminaire

(5) LED grazer, To be concealed in architectural details

(5) Recessed exterior downlights

(7) Pathway Bollards

Indicative product images. Final product TBC

6.3 Luminaire mounting

Luminaires serving general circulation areas should be integrated to the architectural details where possible to minimise visual cluttering. Ceiling recessed downlights and wall mounted fittings should be used where possible. Pole mounted luminaires for circulation are to be low height poles (<6m) that are aesthetically appropriate to the scale of the building. Bollards would be considered if the pathway is close to landscape areas.

6.4 Luminaire rating

To provide the appropriate weatherproof and impact resistance, the outdoor luminaires are to have the following minimum ratings:

- IP65 and IK07 (if mounted at or above 2700mm AFFL)
- IP67 and IK08 (if mounted below 2700mm AFFL)

6.5 Switching and control

The site is fenced and use of the facility will generally be controlled after hours. Circulation lighting within the fence shall be time clock controlled and switched off after 10pm. Lighting around the building outside of the fence are to be timeclock controlled. Lighting provided for security purposes will operate between dusk and dawn where required. The extent of security will be confirmed as the design progresses further.

The entrance of the school and porte cochere of the main Admin & Clinical Building are to be dimmable, providing a higher lighting level in the early evening and gradually dimmed down later towards the evening.

PE Cell override will be provided during daytime, allowing the lighting to be activated during overcast weather.

7 Control & Mitigation of Obtrusive Lighting

The Macquarie University Observatory is located approximately 190m Northwest of the proposed RIDBC site. A careful and well considered lighting design must be in place to mitigate any lighting that may affect the operation of the observatory.

The design will ensure compliance to AS4282 – Control of Obtrusive Effects of Outdoor Lighting, which provides the numerical requirements that limit spill light to the adjoining properties and traffic.

The Dark Sky Planning Guideline will be used as reference. The Guideline outlined the key factors that have the potential to impact the observing conditions at an Observatory, and measurable parameters that can be considered and managed in a development assessment. The key factors that can be applied on the RIDBC development includes:

- The quantity of light
- The type of light emitted; and
- The direction in which the light shines

7.1 Quantity of Light

The cumulative lighting level from the light sources has significant effect to the observing conditions at an observatory.

It is recommended that the outdoor lighting at RIDBC will be scheduled and dimmable as part of the RIDBC outdoor lighting strategy. This ensures that the appropriate level of lighting is delivered when needed. A higher illuminance can be provided at the early evenings (before 8pm, final schedule to be refined based on the operation of the buildings). The entrances for both the school and the Admin & Clinical Building can be illuminated to a higher level during events/when the buildings are still occupied, dimmed to a lower level later in the evening, providing the security lighting required while reducing the spill light to the sky.

Base on further design development and coordination with the design team, the outdoor lighting can potentially be switched off afterhours.

School Entrance – Early Evening

School Entrance – Late Evening

Admin & Clinical Porte Cochere – Early Evening

Admin & Clinical Porte Cochere – Late Evening

7.2 Type of Light Emitted

The Dark Sky Guideline recommended that as the atmosphere scatters blue rich light the most, a warm white colour temperature for the artificial lighting (below 3500K) would reduce the impact of light on the observing environment.

The RIDBC outdoor lighting will follow this principle and select luminaires with the 2700K – 3000K colour temperature, which would also compliment the warm finish of the building.

Table 1 Common bulb types and associated colour temperature

Bulb type	Colour temperature	Colour appearance	Best lighting
Full spectrum fluorescent	5000K	Cool	Least preferred
Cool white fluorescent	4100K	Intermediate	
Metal halide	4000K	Intermediate	
Soft white fluorescent	3500K	Intermediate	
Warm white fluorescent, tungsten halogen	3000K	Warm	
Standard incandescent	2700K	Warm	
High pressure sodium	2200K	Warm orange/peach	Most preferred

Note: With LEDs, any colour temperature can be produced, but warm colours are preferred.

Table 1, extracted from Dark Sky Planning Guideline

7.3 Direction of Light

The aiming angle of the artificial light has a direct impact on the amount of obtrusive lighting. Reducing artificial skyglow can be achieved by ensuring that light shines below the horizontal plane.

Uplighting and bare floodlights will not be used in this project to ensure that the lighting will not interfere with the MQU Observatory. All luminaires will have an Upward Light Output Ratio (ULOR) of less than 5%. Bollards and light poles will have appropriately developed optic that prevent unwanted spill lights upward.

7.4 Control of Internal Lighting

Internal lighting typically does not contribute significantly to skyglow. The operation of RIDBC would also anticipate limited afterhours activities. However, to help prevent unwanted spill light from within the building, all internal lighting will be timeclock controlled with motion detectors activations. The lighting system will be automated so that all lighting will be scheduled to be turned off afterhours, activated for a limited time via motion sensors should movements be detected within the building.

Extended afterhours lighting operation will be managed by the facility managers.

7.5 Finishes

As recommended in the Dark Sky Planning Guideline, the design should avoid directing lighting towards reflective surfaces. This will be achieved through coordination with the architectural team, confirming the material finishes as part of the design process.

Table 3 *Reflective properties of common surfaces*

Surface	Reflective properties
Natural grass and vegetation	Low
Painted surface (dark)	Low
Pre-coloured factory metal (dark)	Low
Brick (dark)	Low
Raw or stained timber	Medium
Stone surface	Medium
Uncoloured concrete	High
Painted surface (light)	High
Artificial grass (sand base)	High
Pre-coloured factory metal (light)	High
Brick (light)	High
Zincalume steel (unpainted)	High

Table 3, extracted from Dark Sky Planning Guideline

8 Proposed Design Parameters

8.1 Admin & Clinical Building Porte Cochere

For the Admin & Clinical Building porte cochere, a higher illuminance is proposed to allow for wayfinding and easy identification of access to the building.

Category	Classification
Type of road or pathway	Public Activity Areas
Basic operating characteristics	Pedestrian/Vehicle
Pedestrian/cycle activity	Medium
Fear of crime	Medium
Need to enhance amenity	Yes
Applicable lighting subcategory	PA2

Pedestrian pathways will adopt the following lighting parameters:

Parameter	Value
Average horizontal illuminance	14 lx
Point horizontal illuminance	4 lx
Illuminance (horizontal) uniformity Cat. P	8
Point vertical illuminance	4 lx

8.2 School Main Entrance

At the School Main Entrance, it is proposed that the lighting is dimmable. In normal operation. This allows for a higher lighting level if there are events held at the school, but otherwise dimmed to a lower level for normal operations:

Category	Classification	
Type of road or pathway	Pedestrian or cycle oriented pathway	
Basic operating characteristics	Pedestrian/cycle traffic only	
	Normal Operation	**Events**
Pedestrian/cycle activity	Low	High
Fear of crime	Medium	N/A
Need to enhance amenity	Yes	
Applicable lighting subcategory	PR2	PR1

Pedestrian pathways will adopt the following lighting parameters:

Parameter	Value	
Average horizontal illuminance	3.5 lx	7 lx
Point horizontal illuminance	0.7 lx	2 lx
Illuminance (horizontal) uniformity Cat. P	8	8

8.3 Pedestrian Pathway (outside building)

AS/NZS 1158.3.1 define lighting classifications and parameters for pedestrian pathways (walkways).

The outside the building have the following assessment:

Category	Classification
Type of road or pathway	Pedestrian or cycle oriented pathway
Basic operating characteristics	Pedestrian/cycle traffic only
Pedestrian/cycle activity	Low
Fear of crime	Medium
Need to enhance amenity	N/A
Applicable lighting subcategory	PP3

Pedestrian pathways will adopt the following lighting parameters:

Parameter	Value
Average horizontal illuminance	3 lx
Point horizontal illuminance	0.5 lx
Illuminance (horizontal) uniformity Cat. P	5
Point vertical illuminance	0.1 lx

8.4 External Parking Area

For the parking outside of the school main entrance and the Admin & Clinical Building:

Category	Classification
Type of road or pathway	Carpark
Basic operating characteristics	Carpark
Pedestrian/cycle activity	Medium
Fear of crime	Medium
Need to enhance amenity	N/A
Applicable lighting subcategory	PC2 / PCX (Disabled Carpark)

Pedestrian pathways will adopt the following lighting parameters:

Parameter	PC2	PCX (Location TBC)
Average horizontal illuminance	7 lx	21lx
Point horizontal illuminance	1.5 lx	5 lx
Illuminance (horizontal) uniformity Cat. P	8	8
Point vertical illuminance	1 lx	N/A

8.5 COLA and Covered Open Walkway (Admin & Clinical Building)

The COLA will be used for learning activities during school hours and lit to a high illuminance. However the lighting will be dimmed to a lower level afterhours for circulation. The nature will be similar to the Covered Open Walkway at the Admin & Clinical Building

Category	Classification
Type of activity	Circulation
Operating time	After hours
Type of road or pathway	Pedestrian or cycle oriented pathway
Pedestrian/cycle activity	Low to medium
Fear of crime	Medium
Need to enhance amenity	N/A
Applicable lighting subcategory	PP2

The COLA will adopt the following lighting parameters:

Parameter	Value
Type of activity	Circulation / after hours
Average horizontal illuminance	7 lx
Point horizontal illuminance	1 lx
Illuminance (horizontal) uniformity Cat. P	5
Point vertical illuminance	0.3 lx

8.6 Circulation around Outdoor Learning Space (within fence)

The pathways around the outdoor learning space are within the fenced area and with limited activity afterhours.

Category	Classification
Type of road or pathway	Pedestrian or cycle oriented pathway
Basic operating characteristics	Pedestrian/cycle traffic only
Pedestrian/cycle activity	Low
Fear of crime	Low
Need to enhance amenity	N/A
Applicable lighting subcategory	PP5

Pedestrian pathways will adopt the following lighting parameters:

Parameter	Value
Average horizontal illuminance	0.85 lx
Point horizontal illuminance	0.14 lx
Illuminance (horizontal) uniformity Cat. P	5
Point vertical illuminance	0.02 lx

8.7 Proposed Illuminance Diagram

9 Summary

The RIDBC outdoor lighting will be designed based on good design principles, with consideration to the building usage, security assessment from CTPED, Australian Standards lighting design parameters and Dark Sky Planning Guideline recommendations. The outdoor lighting design is based on:

- Creating a safe and welcoming environment
- Accentuating architectural features appropriately
- Spaces will not be overlit and will be designed according to AS/NZS1158.3.1:2020
- Obtrusive lighting will be mitigated and designed according to AS/NZS4282:2019
- Illuminance levels at the entrance points are controllable, allowing higher lighting setting for events and afterhours activities, dimmed/turned off when lower usage and/or crime risk are anticipated
- Providing illumination level appropriate for the anticipated pedestrian volume and fear of crime, in line with Australian Standards
- Using warm white lamp colour temperature, appropriate for the building design and providing reduced skyglow as per Dark Sky Planning Guidelines
- Luminaires will be aimed to the design area, with no upward lighting
- Luminaires will have the appropriate weatherproof and impact resistance rating
- All outdoor lighting will be timeclock controlled and dimmed down/switched off when appropriate, limiting energy usage and minimising obtrusive lighting to the neighbour properties and MQU Observatory
- PE cell override will be provided to allow for daytime operation during overcast condition