If a building becomes architecture, then it is art. Clearly, if a building is not functionally and technically in order, then it isn't architecture either – it's just a building.
Arne Jacobsen

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

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LIGHTING DESIGN

STEENSEN VARMING

Carlingford West Public School & Cumberland high School Upgrades- Lighting Design SSDA Report

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1.0 Executive Summary

This report has been prepared for the Carlingford West Public School and Cumberland High School SSDA in response to the SEARs General Requirement 5.0 – Environmental Amenity with particular reference to "Assess amenity impacts on the surrounding locality, including lighting impacts."

This report provides an overview of how the external lighting shall be approached and the strategies applied to mitigate potential spill light.

A successful external lighting strategy will be holistic in its consideration of both public and private use with consideration to the human experience, and the impact on local wildlife, sustainability and considers the built architectural form.

The external lighting will focus on key elements including the external carpark, connecting pedestrian pathway, building transition points from external to internal lighting.

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2.0 Project Background

2.1 Proposed evelopment

The proposed development involves upgrades to Carlingford West Public School (CWPS) and Cumberland High School (CHS), collectively referred to as the Cumberland Cluster.

The upgrades to CWPS will cater for a total student population of 1,610 and include the construction of four new buildings in the north-west portion of the site known as buildings W, X, Y and Z. These buildings range from one to three storeys and contain a variety of uses including general learning spaces, library, amenities, staff rooms and combined canteen, out of school hours care (OSHC), gym and hall. The construction of a new kiss and ride off Felton Road West and a waste loading area, On-Site Detention (OSD) tank and staff carpark.

The works proposed at CHS will cater for a total student population of 2,040 and include the construction of three new buildings in the south-east portion of the site known as buildings X, Y and Z. These buildings range from one to five storeys and contain a variety of uses including a general and specialists learning spaces, library, administration, staff and student amenities, and combined lecture theatre, movement space, canteen, stage and gym/hall. The works also propose the construction of a new one-way bus link road and waste loading area from Dunmore Avenue to Pennant Hills Road.

Associated civil works and landscape works are proposed across both school sites including tree removal and planting and new play areas as well as public domain upgrades by widening nearby footpaths.

Ancillary Works Subject to Separate Approval

Under *State Environmental Planning Policy (Transport and Infrastructure)* 2021 (T and I SEPP), certain works can be undertaken as exempt development (no planning approval required), complying development (complying development certificate issued for works through a private certifier or Council) or development permitted without consent (Part 5 approval). As shown in Figure X and detailed below, the following works are being undertaken separate to this SSDA and do not form part of the scope of works:

Complying Development Certificate (CDC): Include the location of temporary demountables. Refurbishment of CWPS buildings A and B for administration and staff purposes. Demolition of existing CWPS buildings C and J. Demolition of existing CHS buildings B and F.

Exempt Development: Include two new sports courts for CWPS and four new sports courts for CHS.

Review of Environmental Factors (REF) Part 5 Approval: Include a new kiss n ride link road from Dunmore Avenue to Blenheim Road with a connecting staff carparking and OSD tank. Key details include:

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- Demolition of existing structures, including sports courts, a bus shelter and retaining walls,
- Removal of trees in the area around the car park and pruning of trees along the eastern boundary,
- Construction of new single lane one way road adjacent to the eastern boundary. Vehicles will enter the road via the Dunmore Avenue turning head and exit onto Blenheim Road,
- A 1.8m - 2.5m fence along the eastern boundary and access handle at Blenheim Road. The fence will function as a security and acoustic barrier,
- Adjustments to the turning head within the site adjoining Dunmore Avenue to create the new road connection,
- Public domain and infrastructure adjustments to Blenheim Road including new vehicle cross over, relocation of a power pole and relocation of a drainage pit,
- New stormwater infrastructure including an on-site detention tank below the car park,
- Renewal and extension of the existing staff carpark, including relocating the entry driveway to create a connection with the new road, and
- Landscaping and lighting infrastructure.

REF Part 5 Approval: Refurbishment of CHS building E, A, D, C and G.

The future appointed main works contractor will decommission services and temporary demountables to allow for them to be removed off site by others at the end of the project, with make good of the school oval once demountables are removed to be completed by the main works contractor shortly thereafter.

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Figure 1: Works Outside of SSDA Approval (Source: Woods Bagot)

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2.2 Site Description

The site is located at 59-73 Felton Road and 183 Pennant Hills Road, Carlingford and is legally described as follows.

SCHOOL	LOT AND DP	LOT AREA
CWPS	Lot 1 DP 235625	0.4698ha
	Lot 2 DP 235625	2.363ha
	Lot 5 DP 235625	0.3958ha
CHS	Lot 3 DP 235625 (part CWPS)	4.736ha
	Lot 4 DP 235625	1.421ha

An aerial view of the site is provided in Figure X. The site includes two schools, CWPS in the north of the site and CHS to the south. The school sites are separated by playing grounds in the centre of the site and the schools operate independently. The surrounding area is predominantly characterised by low density residential dwellings.

Figure 2: Aerial view, site outlined red (Source: Nearmap)

The main CWPS pedestrian and bicycle access points are Felton Road East and Felton Road West. A secondary pedestrian access from the north is also available from Hilar Avenue. From the south, pedestrian can also access CWPS via CHS from Pennant Hills Road, Dunmore Avenue and Blenheim Road.

The main CHS pedestrian and bicycle access points are Pennant Hills Road and Dunmore Avenue. Secondary access is also from Felton Road East, Felton Road West and Hilar Avenue.

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3.0 Introduction

3.1 Response to SEARs

The Cumberland Cluster SEARs Report is required by the Secretary's Environmental Assessment Requirements (SEARs). This table identifies the relevant SEARs requirement/s and corresponding reference/s within this report.

Table 1 – SEARs and Relevant Reference

SEARs Items	Project Response to DGR
5. Environmental Amenity • Assess amenity impacts on the surrounding locality, including lighting impacts	Lighting to be designed in consideration of minimising obtrusive light. Whilst a spill light assessment and obtrusive light calculations will not be formally undertaken, the design is to consider implementation of mitigation measures in line with the intent of AS4282 including mounting orientation of light sources, direction of light, fitting selection with good optical control and a lighting control system to automate the timing of the installation and allow adjustment of intensity at different times.

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4.0 Lighting Approach

Lighting aims to support the user journey at night time, facilitating wayfinding and orientation and to direct people between buildings, site access points and carparks to assist in the creation of a safe environment.

The lighting strategy should consider use of light in conjunction with other architectural aspects rather than solely light levels on the walking surface. By good design, that embraces light and shade and subtle contrasts, it is more likely to achieve a safe design solution than the mere distribution of light across the ground.

The external lighting design will be developed in line with the appropriate and applicable lighting levels as per AS1158.3.1 Pedestrian area (Category P) lighting. Calculations will be carried out to confirm the relevant P categories are generally met and not excessively exceeded.

The lighting design should respond to the following objectives:
- Create a welcoming atmosphere
- Support the identity of the school and architecture
- Be flexible to meet the changing requirements throughout the evening
- Facilitate wayfinding and orientation
- Preserve and protect the night -time environment by minimising upward waste light contributing to sky glow
- Support the transition from exterior to interior spaces
- Be sustainable and energy efficient through selection of fittings, lighting control and minimising maintenance requirements.

Consideration should be given to:
- Lighting of main entries and key façade elements to create focal points and a night time hierarchy
- Layered lighting approach
- Appropriate scale for the users of the external spaces
- Daytime visual impact of luminaires and equipment
- Careful selection and placement of lighting equipment to not cause discomfort or glare or intrude on important vistas
- Careful consideration of vistas and views from adjacent properties
- Placement and installation of luminaires to minimise damage to flora
- Use of warm lighting with reduced blue and UV wavelengths to reduce risk of disturbance to fauna

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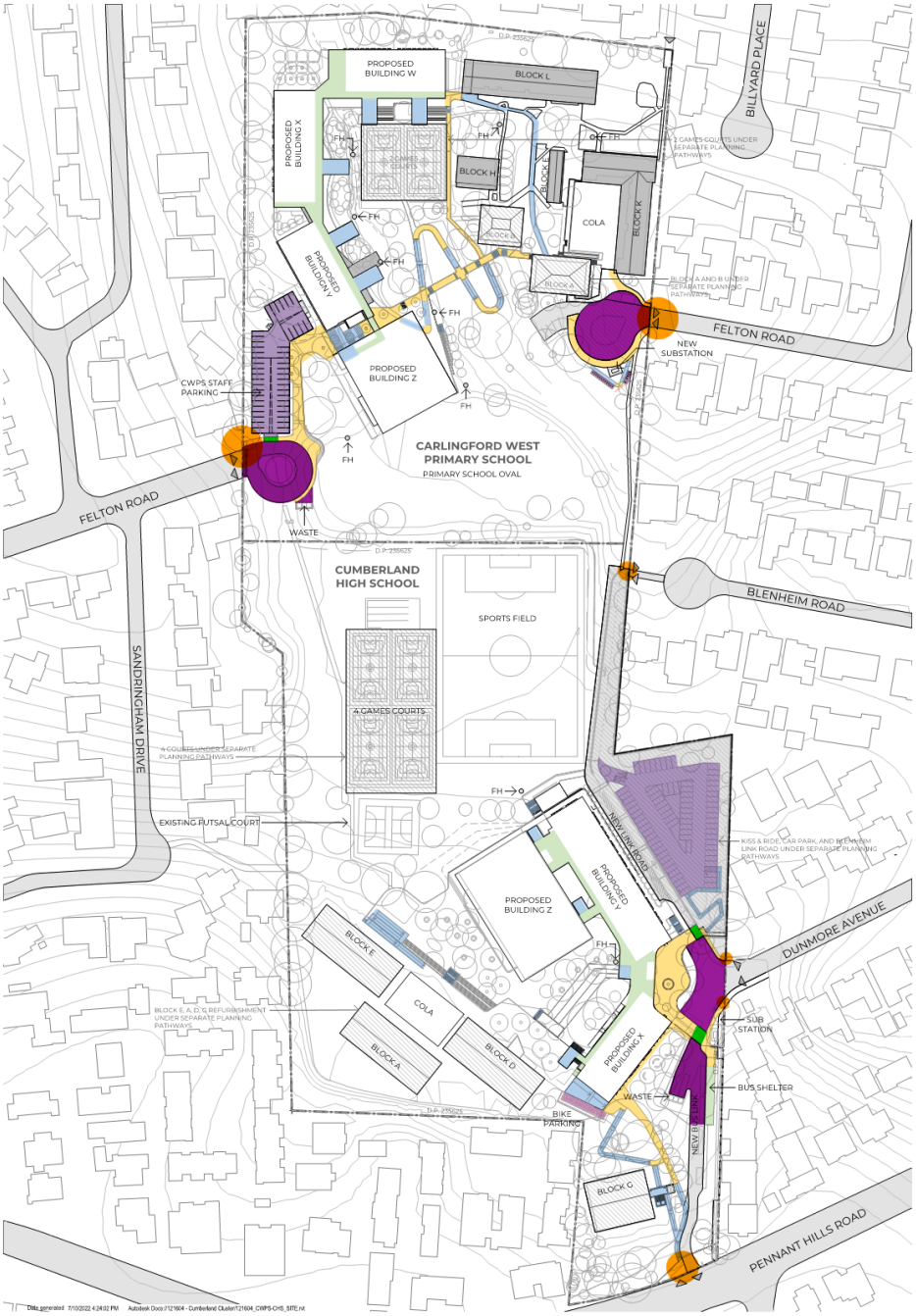

LEGEND

P CATEGORY

- PE3 to external stairs and ramps
- PA3 to covered external pathway lighting – under awning lighting and bus link shelter
- PP3/ PP4 to open pedestrian pathways (focus on horizontal illuminance)
- PP2 for entry areas (horizontal and vertical illuminance)
- PP3 for external bike parking
- External Carpark Entry to AS1680 Increased lighting to accessible spaces to align with PCD
- PR3 Roundabout zones and internal roads
- PX3 Pedestrian Crossings

No lighting to games field or games courts

Figure 3: Pedestrian Category Lighting Strategy

The lighting should be of a high quality, considering light colour, rendering and distribution to maximise the impact of the areas night-time appearance.

The external lighting will focus on key elements including the carparks, connecting pedestrian pathways, stairs and covered walkways. building transition points from external to internal, and limited areas of the new bus link. Where internal lighting

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contributes to the external appearance of the building, this will provide a more subtle night-time atmosphere for adjacent external spaces, in turn reducing the extent of outdoor lighting required.

The vehicular road from Dunmore Avenue will be lit where there are shared pedestrian zones including the waste pickup location and the bus shelter. There is to be no lighting to the new bus link between the CHS bus shelter and the entry at Pennant Hills Road, nor beyond the pedestrian crossing to Blenheim Road. Pedestrian path lighting within this area will comply to the standards to provide safe pedestrian movement minimise obtrusive light spill to surrounding sensitive areas, namely residential housing adjoining the site.

Lighting for the CHS carpark between Blenheim Road and Dunmore Avenue and the CWPS carpark to the west at Felton Road shall be provided by pole top fittings to ensure adequate coverage and to meet the vertical lighting requirements. The scale, height and aesthetic of the pole top fittings shall be considered to ensure a minimally visually obtrusive design is provided and to ensure seamless integration with both the architectural and urban context. All pole top fittings shall comprise of direct downward aiming (full cut-off), and utilise shields, louvers or baffles as required to minimise the effects of unwanted spill light and obtrusive light towards neighbouring properties.

4.1.1 Measures to reduce spill light

The lighting design is to be developed in consideration of minimising obtrusive light.

Whilst a spill light assessment and obtrusive light calculations will not be formally undertaken, the design is to consider the implementation of mitigation measures in line with the intent of AS4282 to reduce spill light on sensitive use areas including:

- Selection of luminaires with appropriate distribution for the task
- Where lighting horizontal surfaces, luminaries to have minimal upwards light ratio
- Mounting orientation of light sources
- Direction of light
- Fitting selection with good optical control
- Minimisation of direct visibility of light sources (no omni-directional luminaries)
- Use of shields and louvres where appropriate
- Use of lighting control system to dim/ control lighting and automate the timing of the installation to allow adjustment of intensity at different times
- Consideration of sight lines and different viewing angles in design to minimise glare

4.1.2 Lighting Control

To reduce energy consumption and create an appropriate night-time environment that considers surrounding properties, the use of dimmable lighting and a lighting control system is recommended.

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A timed light-level approach is recommended, whereby through the use of PE Cells and timers, the lighting intensity shall be dimmed at different times of the evening to minimise the effects of spill light to not only neighbouring properties but also to mitigate the effects of light pollution. After curfew hours and outside of normal operation hours, when fewer people are using the space, light intensity may be reduced, and some lighting elements turned off.

For the carparks and vehicular access routes, consideration is to be given to the use of motion sensors to reduce the lighting intensity outside of peak usage hours.

The hours of operation for the external lighting can be finalised during the commissioning and programming stage at the end of the construction stage of the project and shall be coordinated with the client at this time to ensure brief requirements are met. A curfew period is recommended within the lighting control strategy to minimise to overall lighting levels during 11pm and 6am with only essential lighting operational in this time for safe movement. The lighting curfew times, and essential lighting elements shall be discussed and agreed with the client to ensure brief requirements are met.