

E05076 – Hexham Road External Lighting Strategy for Planning

HCC Property Services

Electrical Engineering Services

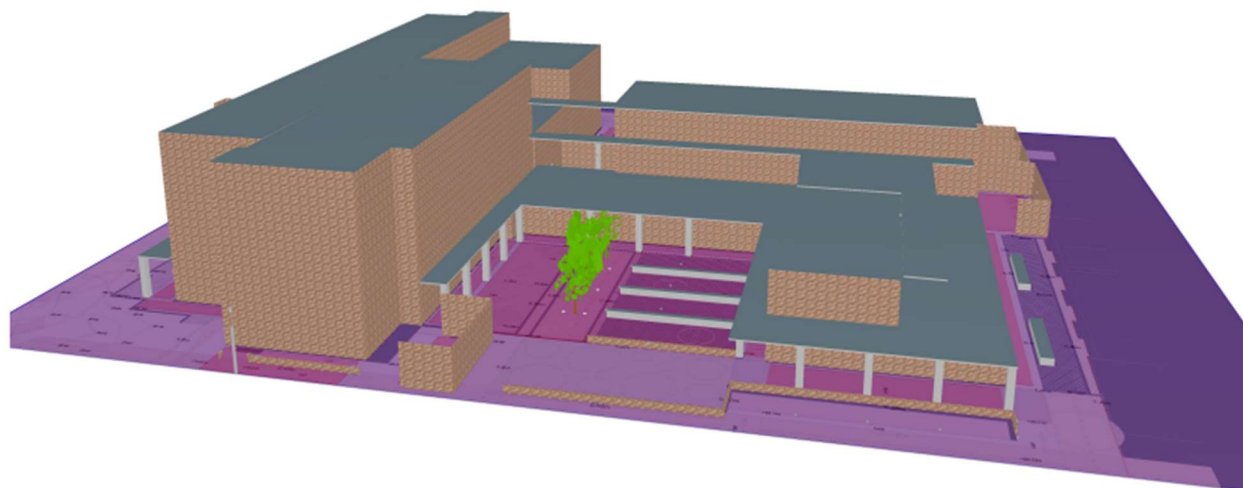
Information for Planning – External

Lighting Strategy

E05076 Hexham Road Redevelopment

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E05076 – Hexham Road External Lighting Strategy for Planning

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1 Executive Summary

The following information outlines the strategy at planning stage for the proposed external lighting at Hexham Road Redevelopment, Reading. RG2 7UQ.

An appropriate lighting strategy for the site has been developed and assessment made of effects on the surrounding environment and neighboring properties.

The lighting scheme in this report is a lighting design strategy rather than a detailed design solution. It is recommended that the lighting strategy outlined in this report is adopted including criteria, luminaries, switching methods, lamp types etc. and developed into a more detailed design when undertaking the full external lighting design of the site.

An adequate and safe level of lighting will be provided for site tasks, residents and community activities, amenity and security, whilst maintaining a minimal impact on the site surroundings, environment and neighboring properties.

This lighting strategy considers building-mounted external lighting, pathway lighting, amenity lighting, car park lighting, lighting to the courtyard and sensory garden.

These proposals have been prepared with due note of the recommendations made within ILP Guidance Note 01: 2020 – Guidance notes for the reduction of obtrusive light.

We have looked at finding a way of making it easier to understand this report and also we have provided information that could be utilised for the planning application. In order to provide this information, it has been necessary to prepare a Sky Glow calculation and then, modify our lighting layout to ensure this will comply with the local authority requirements.

2 Introduction

This report outlines the external lighting strategy for the new development and considers the potential effects of the proposed development's lighting installation on the surrounding areas. The report accompanies the planning application for the proposed Hexham Road Redevelopment.

3 Scope of External Lighting Report

3.2 Site Location & Description

The Hexham Road Redevelopment is well connected to existing transport and footway infrastructure, with doctors, dentists, parks, shops, etc. all within easy walking distance. The development proposals seek full planning permission.

The redevelopment of the site will consist of a day centre providing social care services (Use Class E(f)) and specialist housing (Use Class C3) with landscaping, car parking

and access at 2 Hexham Road, Reading. The building will provide a total of 42 dwellings, including 6 general needs flats located at ground floor level and 36 sheltered housing flats on the upper three levels. Two of the general needs flats will be wheelchair accessible. The ground floor also accommodates a 31 place day care service for people with profound and multiple learning difficulties and associated, car parking, open garden spaces and other infrastructure.

3.3 Objectives

The general objective of this report is to provide details of the proposed external lighting and assess the likely impact of the lighting scheme for the proposed Hexham Road Redevelopment Development on the environment and surrounding areas.

The specific objectives of the proposed lighting scheme, when fully designed, will be able:

- To limit light trespass pollution, sky glow and source intensity.
- To limit obtrusive light, spill light / light trespass and glare to neighboring land and properties
- To provide an external lighting strategy and level of illuminance that addresses site security and complies with the police initiative 'Secured by Design' approach
- To provide a safe and adequate level of illuminance for the proposed exterior areas, consisting of entrances/ exits, access routes for cars and transportation, pedestrian and cycle paths, loading bays and lay down areas, car parks and cycle parks, and to allow the site to receive deliveries notionally Mon-Fri 0700-1700, to be confirmed and agreed with the site.
- To provide a safe level of illuminance for movement of vehicles, goods and persons.

4 Assessment methodology

An appropriate initial lighting scheme for the site has been assessed using Relux standard industry software. Any stated lighting outputs have been calculated with all the luminaries switched on.

From these initial calculations, lighting plots illustrating the illuminance levels throughout the site and at the boundary have been produced so that the lightings scheme's impact can be assessed.

Also by completing the Sky Glow spreadsheet, we have then been able to ascertain the Pre-Curfew and Post Curfew levels of Light Trespass and Source Brightness. As one of the Elevations (East) fails Post Curfew, we have prepared a reduction in output based upon operating specific luminaires that will operate Post Curfew (11.00pm until dawn) for whole site. Once this information is incorporated, the site will fully comply with the Sky Glow requirement.

The lighting layout is basically the same as previously provided, but the light output has been reduced (this could all be set at the commissioning stage) to ensure that the project

complies with the local authority requirements. The LED tape has been reduced in output to 40% and similarly, the wall mounted luminaires have also been reduced in output. - generally 50%. Brick lights and uplights have been reduced by 85% - 88% in order to achieve the very strict upward light regulation.

Refer to accompanying lighting information for details of full calculations which are included to back up the information. Also included are the full Sky Glow, light trespass and source intensity tables to show compliance.

4.1 Lighting Design Criteria

Relevant legislation, key guidance documents and design standards will be indicated as part of this lighting report, which will form the basis of the detailed lighting design.

4.2 Legislation

- Clean Neighborhoods and Environment Act
- The Clean Neighborhoods and Environment Act 2005 (CNEA) amended.
- Section 79 of the Environmental Protection Act 1990

Since 6th April 2006, artificial light can be considered a statutory nuisance unless it is from exempt premises.

If a light nuisance is considered by a local authority to exist, the local authority must serve a notice on the person responsible requiring the abatement of the nuisance, and/or restricting or prohibiting its recurrence.

4.3 National Policy Planning Policy Framework

The National Planning Policy Framework (NPPF) was revised on the 24th of July 2018 and subsequently updated on 19th February 2019 and 19th June 2019. This supersedes the existing policy within the previous NPPF (March 2012). The revised NPPF includes several references to the need to consider the effects of artificial lighting.

4.4 Local Policy Reading Borough Local Plan (2019)

- The Reading Borough Local Plan was adopted in November 2019 and guides development in Reading up to 2031.
- CC7: Design and the Public Realm: The development will be of high design quality that maintains and enhances the character and appearance of the area of Reading in which it is located.
- CC8: Safeguarding Amenity: The Development will not cause a detrimental impact on the living environment of existing residential properties or unacceptable living conditions for new residential properties, in terms of Artificial lighting.

- EN16: Pollution and Water Resources: The Development will only be permitted where it would not be damaging the environment and sensitive receptors through land, noise, or light pollution.

5 Standards

- BS EN 13201-1:2014 Road Lighting, Part 1 Guidelines on selection of lighting classes: specifies the lighting classes set out in EN 13201-2 and gives guidelines on the selection of the most appropriate class for a given situation.
- BS EN 13201-2:2015 Road lighting - Performance requirements: Defines performance requirements which are specified as lighting classes for road lighting aiming at the visual needs of road users, and it considers environmental aspects of road lighting.
- BS EN 5489-1:2013 Code of Practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas: This document provides specific guidance on selecting lighting classes that will help design more energy efficient road lighting schemes. It gives the most up-to-date recommendations for general principles of road lighting including aesthetic, technical aspects, operation and maintenance.
- BS EN 12464-2:2014 Light and lighting - Lighting of workplaces Part 2: Outdoor work: This document outlines requirements for lighting outdoor workplaces, focusing primarily on visual comfort and performance.
- CIBSE (2016) Lighting Guide LG6 – The Outdoor Environment: presents lighting solutions to basic visual problems and individual characteristics of outdoor lighting applications.

5.1 Lighting Requirements

All external lighting will be designed in accordance with the following lighting standards and guidance, as a minimum.

- BS EN 12464-2:2014; Light and lighting – Lighting of workplaces Part 2: Outdoor work.
- BS EN 5489-1:2013; Code of Practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas.
- BS EN 13201-1:2015 Road Lighting, Part 1 Guidelines on selection of lighting classes.
- BS EN 13201-2:2015 Road Lighting, Part 2 Performance Requirements.
- CIBSE (2016) Lighting Guide LG6 – The Outdoor Environment.

5.2 The Proposed Lighting Scheme

The lighting scheme detailed in this report is a lighting design strategy rather than a detailed design solution.

5.3 Recommended lighting level values

Lighting levels will be in accordance with SLL Code for Lighting, BS12464-2 and ILP Guidance Note 01-2020 – Guidance note for the reduction of obtrusive light/ light

trespass.

5.4 Strategy for Minimizing Obtrusive Light and Visual Impact of the lighting Scheme.

Careful consideration will be given to reducing obtrusive light during the night and the visual impact of the lighting scheme during the day, whilst maintaining an adequate level of illuminance for its application on the site. Particular attention will be paid to minimizing any intrusion, glare or sky glow produced by the scheme.

The proposed columns have been chosen to be as inconspicuous as possible. The luminaire column shall generally be galvanized steel or grey coloured. All the luminaires will have 0% upward light ratio, and all necessary measures to reduce the visibility of the light source.

Wherever possible luminaires are to be orientated towards the site, away from the land outside the site to make them less intrusive. Luminaires have been selected to have good light control and cut off angles to reduce light spillage. All the luminaires are directed at the ground to minimize glare.

Building mounted luminaires have been proposed to illuminate final exits and pathways around the building, which have a flat glass to reduce visibility of the light source and have 0% upward light component.

Consideration has been given to reducing the extent of illuminance falling on the building façade to reduce the visual impact of the buildings from a distance, whilst maintaining safe light levels for pedestrian circulation during the hours of darkness, and for security.

5.5 Strategy for Luminaire Types

The site shall be lit using LED luminaries throughout. These will be column-mounted in the car park area, and building mounted LED luminaires will be utilized around the building for amenity and security purposes.

LED luminaires will be utilized throughout, which will provide good colour rendering to improve visibility and provide a safer environment in line with a 'secured by design' approach. Using LED luminaires will provide an energy efficient solution, and Part L and BREEAM compliance. The proposed luminaries, or equal and approved, have been selected as they have been designed to be anti-light pollution and low glare with good levels of efficiency and low upward light ratio.

All the luminaries are IP54/ 66 rated and impact resistant. For specific details, refer to supplementary information that accompanies this report.

5.6 Lighting Strategy and Luminaire Controls

Lighting controls will be utilized to ensure energy saving and minimized impact on the surrounding areas.

The amenity lighting and car park lighting will be timeclock controlled, with individual switches for each lighting column, bollards, which will be located in a planter cubicle in the courtyard and along the south elevation adjacent to Bede walk in a suitable location, with consideration given to a duplicate set of switch controls located within the building. Time periods will be set to facilitate community use for the required days/times.

An override facility will be installed should car park lighting outside normal time periods be required.

Building mounted lighting for amenity and security will have timeclock and photocell control, with lights coming on at dusk for amenity and security use, and going off at a pre-determined time, which will be agreed.

Photocells are to be used as a primary control on all amenity and car park lighting so that no luminaries will be left on during daylight hours. In addition, several programmable 7-day time clocks will be wired into the control system so that the amenity lighting circuits can be programmed to turn on/off as and when they are needed to suit the development activities.

All lighting shall be provided with DALI lighting controls or similar and approved to enable lighting to be set to pre-curfew and post curfew light levels.

5.7 Lighting for Car Park

Column-mounted, dark sky compliant luminaries, utilising 20W IP66 LED luminaires as per Thorn Alumet Control Direct LED architectural lighting columns. These luminaries also have controlled directional light with zero upward light output to reduce light pollution, light spill and discomfort glare. The lighting columns will be positioned to keep light spill beyond the site boundary to a minimum.

The carpark will also benefit from the borrowed light from the pedestrian walkway lighting under the north facing entrance canopy.

The luminaires accompanying this report will be controlled via photocell, timeclock and override switch to come on at dusk and go off at predetermined time at night.

5.8 Walkways & Terraces

The pedestrian/ tenant walkways will be provided with recessed linear soffit luminaires comprising IP65 LED tape mounted within an IP20 enclosure that will be recessed within the ceiling pathway soffit at all levels above ground floor. Terraces will be provided with a combination of wall mounted aluminum IP65 11W cylinder downlights mounted to the columns. These wall mounted downlights will provide a cylindrical cone of light to the floor and will have a colour temperature of 3000⁰K, together with IP65 recessed wall mounted brick luminaires, which are made of stainless steel and aluminum, the built-in LEDs are covered by a glass sheet utilising 9.5W LEDs with built-in reflector means that the light output is asymmetrically to provide lighting at low level. These recessed wall mounted brick lights will have a colour temperature of 3000⁰K.

The central pedestrian/ tenant walkway area surrounding the courtyard will be provided with wall mounted cylinder uplighter/ downlighters, these wall mounted aluminum IP65 19W LED cylinder uplighter/ downlights. These wall mounted uplighter/ downlights will provide a cylindrical cone of light to the floor and ceiling soffit and have a colour temperature of 3000⁰K.

The luminaires as proposed by CLS:

- FLS6 10W IP65 LED Tape & PRO35SR Extruded Enclosure (See EL-2 luminaire type below)
- Enola Round M Downlight IP65 (See EL-3 luminaire type below)
- Enola Round M Up/ Downlight IP65 (See EL-6 luminaire type below)
- Brick IP67 (See EL-5 luminaire type below)

The luminaires accompanying this report will be controlled via photocell, timeclock and override switch to come on at dusk and go off at predetermined time at night.

5.9 Lighting for South Entrance

Column-mounted, dark sky compliant luminaries, utilising 20W LED luminaires as per Thorn Alumet Control Direct LED architectural lighting columns. These luminaries also have controlled directional light with zero upward light output to reduce light pollution, light spill and discomfort glare. The lighting columns will be positioned to keep light spill beyond the site boundary to a minimum.

Recessed wall mounted brick luminaire, which is made of stainless steel and aluminum, the built-in LEDs are covered by a glass sheet utilising 9.5W LEDs with built-in reflector means that the light output is asymmetrically to provide lighting at low level. These recessed wall mounted brick lights will have a colour temperature of 3000⁰K and will be installed to the planter walls.

Bollards, which will be located along the south elevation adjacent to Bede walk in a suitable locations.

The luminaire as proposed by CLS:

- Alumet Direct Control IP66 (See EL 1 luminaire type below)
- IP67 Brick light (See EL 5 luminaire type below)

5.10 Communal Garden to the Day Service

The communal garden trees will be provided with in ground 29W LED uplighters strategically located on either side to illuminate the tree trunk. The uplighter will be

provided with close optic control so that minimal spill light is generated. These in ground mounted uplighters will have a colour temperature of 3000⁰K.

Recessed wall mounted brick luminaire will be installed within the planter boxes, the luminaire is made of stainless steel and aluminum, the built-in LEDs are covered by a glass sheet utilising 9.5W LED's with built-in reflector means that the light output is asymmetrically to provide lighting at low level. These recessed wall mounted brick lights will have a colour temperature of 3000⁰K

17W LED Bollards will be installed within the planter boxes to provide a downward light to the planters.

The luminaires as proposed by CLS:

- 9.5W IP67 Brick light (See EL 5 luminaire type below)
- Dasara Symmetrical In ground IP67 Uplight (See EL-7 luminaire type below)
- Bollard IP66 (See EL-4 luminaire type below)

The luminaires accompanying this report will be controlled via photocell, timeclock and override switch to come on at dusk and go off at predetermined time at night.

5.11 The Building mounted luminaires

Building-mounted wall luminaires are proposed for amenity, walkway and security external lighting to the external perimeter of the building at ground floor level, these will generally comprise a combination of wall mounted cylinder uplighter/ downlighters, these wall mounted aluminum IP65 20W LED cylinder uplighter/ downlights. These wall mounted uplighter/ downlights will provide a cylindrical cone of light to the floor and ceiling soffit and have a colour temperature of 3000⁰K. and wall mounted aluminum IP65 11W LED cylinder downlights mounted to the columns. These wall mounted downlights will provide a cylindrical cone of light to the floor and will have a colour temperature of 3000⁰K.

The luminaires as proposed by CLS:

- Enola Round M IP65 Downlight (See EL 3 luminaire type below)
- Enola Round M IP65 Up/ Downlight (See EL 6 luminaire type below)

The luminaires accompanying this report. will be controlled via photocell, timeclock and override switch to come on at dusk and go off at predetermined time at night.

6. Assessment of the impact of the overall lighting scheme (Pre-curfew & Post-curfew)

Drawings and the accompanying manufacturer's calculations and data sheets, show the lighting scheme for the:

- Ground floor - Car park and pedestrian entrance lighting
- Ground floor – Courtyard and walkways lighting
- First floor - Walkway lighting
- Second floor – Walkway lighting
- Third floor - Walkway and terraces lighting

With the illuminance levels shown throughout the site and at the boundaries. The calculation model was prepared using industry standard software, Relux. It shows that adequate levels of lighting have been achieved on the site with minimal effect on the surrounding area, as required by the various standards.

7. EXTERNAL LIGHTING 6a – REDUCED OUTPUT (PRE-CURFEW) & EXTERNAL LIGHTING 6b - SECURITY LIGHTING (POST-CURFEW)

Master Calculation Sheet for Skyglow, Light Trespass & Source Intensity

Sky Glow Calculation

		Qty	Lamp Flux	Total flux	LOR	DFF	UFF	upward Flux
Luminaire 1	CLS 1003432 Enola Wall mounted	17	509	8653	1	100	0	0
Luminaire 2	CLSB50QF1X17U4K 1m Bollard	7	726	5082	1	98.1	1.9	96.558
Luminaire 3	105m LED tape in IP65 enc.	105	328	34440	1	100	0	0
Luminaire 4	CLS 1003432 Enola Wall mounted	23	509	11707	1	100	0	0
Luminaire 5	41m LED tape in IP65 enc. - EMG	41	328	13448	1	100	0	0
Luminaire 6	Thorn Alumet 3m high	5	2069	10345	1	99.7	0.3	31.035
Luminaire 7	CLS233650 Bricklights	16	132	2112	1	59.2	40.8	861.696
Luminaire 8	CLS1002897 in-ground uplights	8	330	2640	1	0	100	2640
Luminaire 9	CLS1003425 Up/Down Wall mounted	8	956	7648	1	100	0	0
Luminaire 10	CLS1003425EMG Down Wall mounted	9	956	8604	1	100	0	0
Luminaire 11	CLS 1003432 Enola Wall mounted	3	509	1527	1	100	0	0
Luminaire 13	14m LED tape in IP65 enc.	14	328	4592	1	100	0	0
Total				73330			Total	3629.289

4.95% ULR

Table 1	E1	0%
	E2	2.5% Max
	E3	5% Max
	E4	15% Max

PASS

Light Trespass

	Min Vert. Illum (lux)	Max Vert. Illum (lux)	Post Curfew SECURITY Illum (lux)	Pre Curfew (lux)	Post Curfew (lux)	
North of building (Hexham Road)	0.12	0.55	0.25	10	2	Pass / Pass
South of building (Bede Walk)	0.22	1.45	0.62	10	2	Pass / Pass
East of building - Houses to East of Development)	0.00	4.75	1.75	10	2	Pass / Fail
West of building (Northumberland Avenue)	0.07	0.16	0.06	10	2	Pass / Pass

Table 1		Pre- Curfew	Post-Curfew
	E1	2	1*
	E2	5	1
	E3	10	2
	E4	25	5

From Public road lighting installations only

All Elevations pass Pre Curfew but East fails Post Curfew

Note - Recommend that lighting is reduced to Security levels Post Curfew - Calculation shows that all level Pass

PASS Pre Curfew

Fail Post Curfew - Reduce lighting to security level only - (see note)

Source Intensity

	Peak Intensity (cd/1000)	Lamp Flux (lm)	Peak Intensity I (kcd)	Intensity at obtrusive angle I (kcd)	Before Curfew	After Curfew	
Luminaire 1	1552	509	0.79	0.79	10	1	Pass / Pass
Luminaire 2	250	726	0.18	0.18	10	1	Pass / Pass
Luminaire 3	347	328	0.11	0.11	10	1	Pass / Pass
Luminaire 4	1552	509	0.79	0.79	10	1	Pass / Pass
Luminaire 5	347	328	0.11	0.11	10	1	Pass / Pass
Luminaire 6	240	2069	0.50	0.50	10	1	Pass / Pass
Luminaire 7	879	132	0.12	0.12	10	1	Pass / Pass
Luminaire 8	1438	330	0.47	0.47	10	1	Pass / Pass
Luminaire 9	966	956	0.92	0.92	10	1	Pass / Pass
Luminaire 10	966	956	0.92	0.92	10	1	Pass / Pass
Luminaire 11	1552	509	0.79	0.79	10	1	Pass / Pass
Luminaire 13	347	328	0.11	0.11	10	1	Pass / Pass

Table 1		Pre- Curfew	Post-Curfew
	E1	2.5	0
	E2	7.5	0.5
	E3	10	1
	E4	25	2.5

PASS - Pre and Post Curfew

Definition & Explanations in relation to Master calculation sheet for Skyglow, Light trespass and Source Intensity.

Sky glow Calculation – This refers to the upward light for all the luminaires proposed on the lighting scheme at any time (i.e., pre & post curfew) and the resultant calculation should be within the maximum figure stated for the type of external lighting environment. For our proposed development and its location, we have designated the Hexham Road development as E3 as dictated by BS 12464-2, which is Medium district brightness area. Small town centres or urban locations for the basis of our design assessment.

Light Trespass – This is the amount of extraneous light leaving the building (where external lighting has been installed) from all the light sources on that elevation. The vertical illuminance is recorded on the face/ side of each adjacent building for each elevation. Pre and post curfew Lux values are identified as used against the maximum pre and post maximum lux criteria.

Source Intensity – All external luminaires installed should not exceed brightness levels. i.e. for either pre or post curfew times.

E1	Intrinsically dark landscapes	National Parks, Areas of outstanding natural beauty
E2	Low district brightness area.	Rural, small village or relatively dark urban locations
E3	Medium district brightness area.	Small town centres or urban locations
E4	High district brightness area.	Town / City centres with high levels of night time activity

Where an area to be lit falls between two zones, the obtrusive light limitation values used should be those applicable to the most rigorous zone.

ARCHITECTURAL EXTERNAL LIGHTING PROPOSALS

Manufacturers External Lighting Calculations

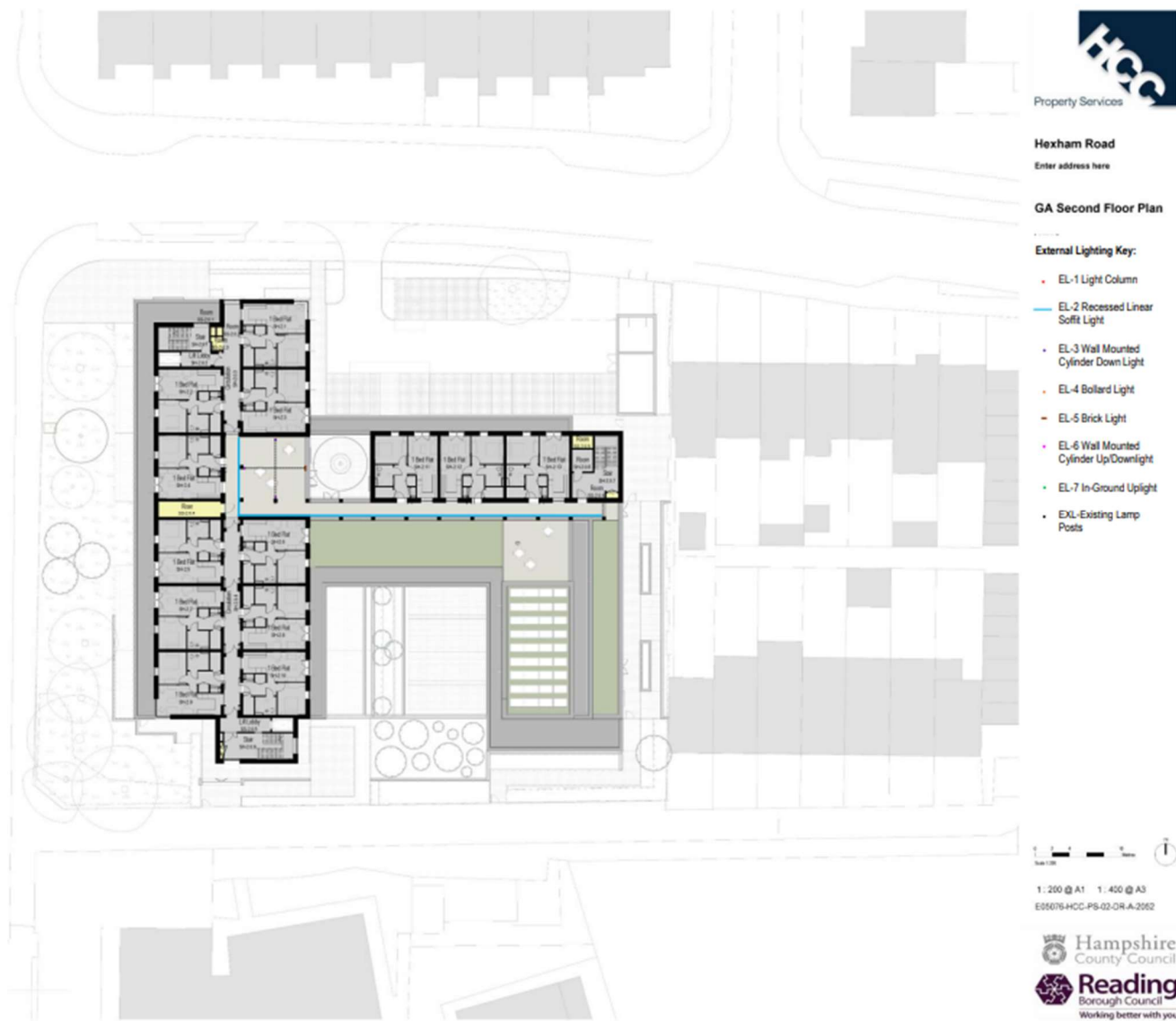
Ground Floor Architectural External Lighting Proposal (Pre-curfew & Post-curfew)



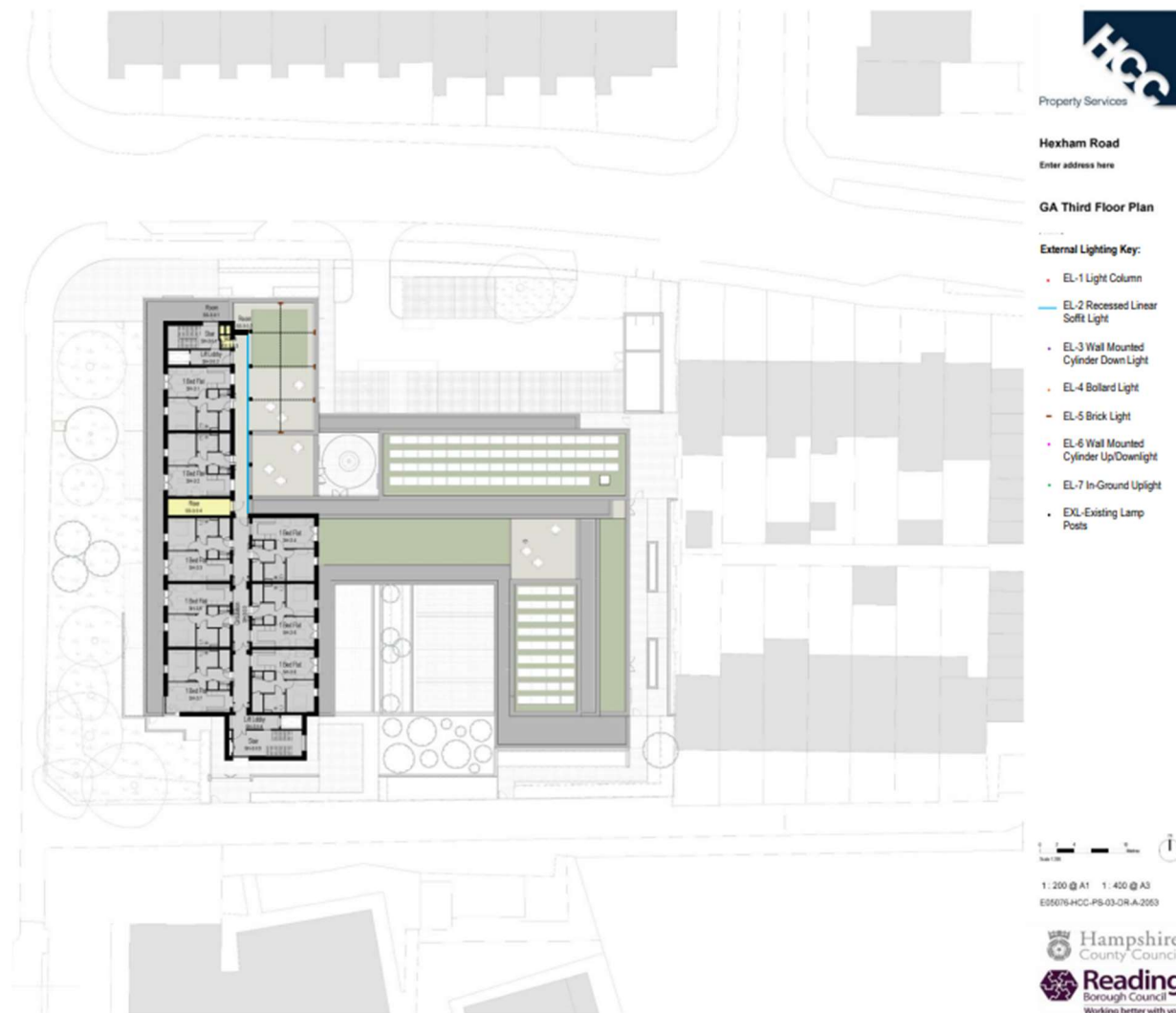
First Floor Architectural External Lighting Proposal



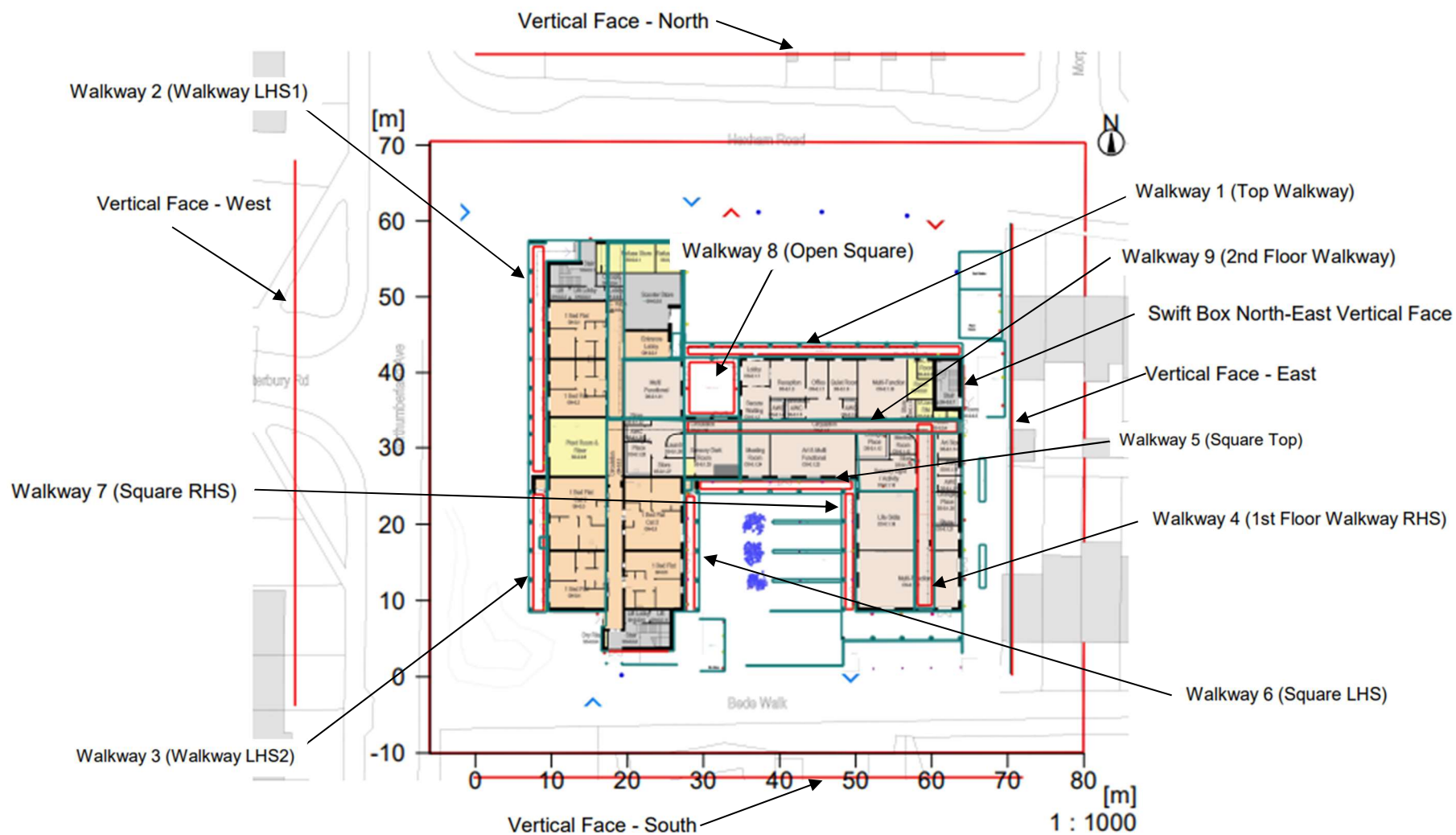
Second Floor Architectural External Lighting Proposal



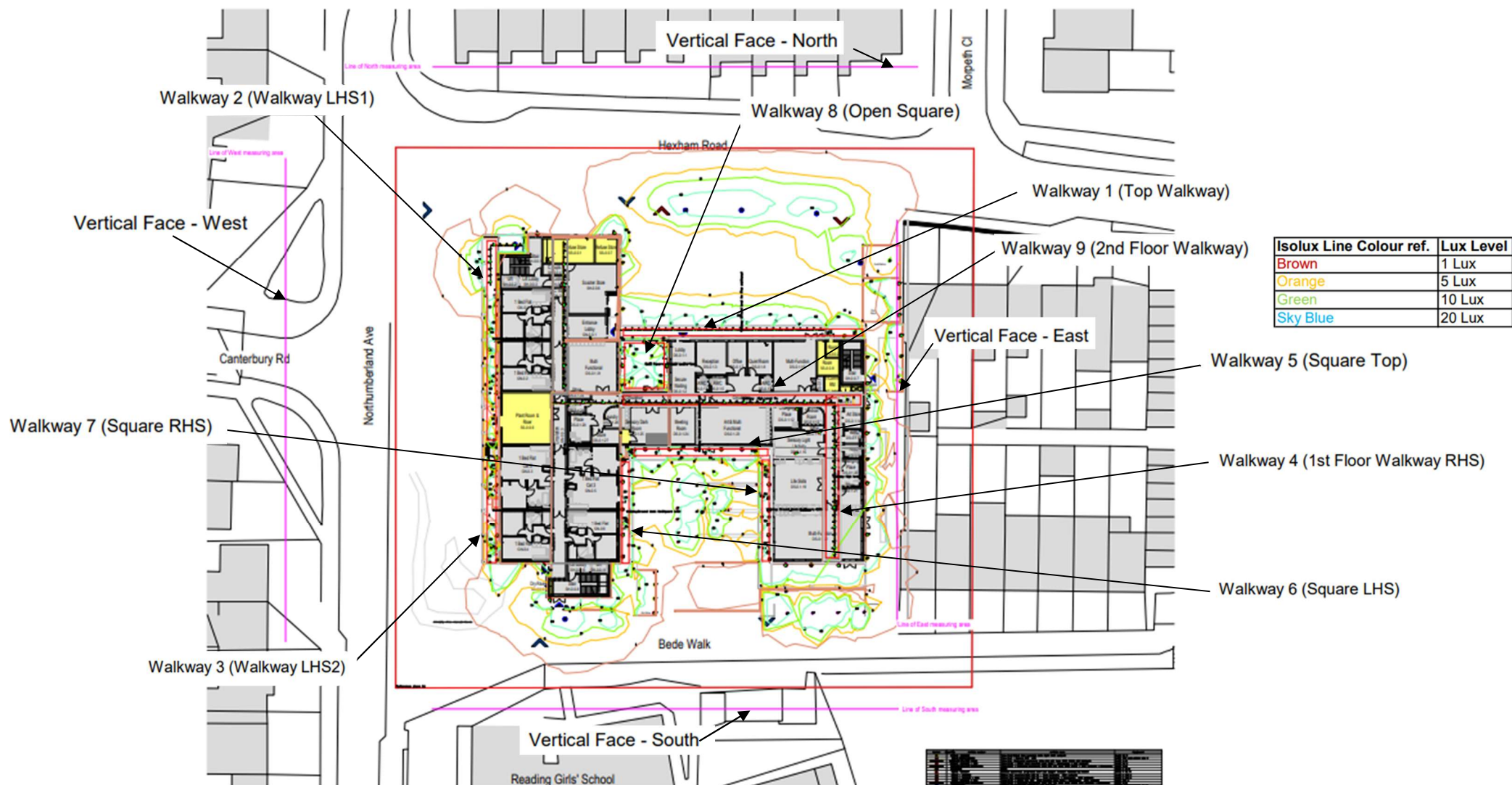
Third Floor Architectural External Lighting Proposal



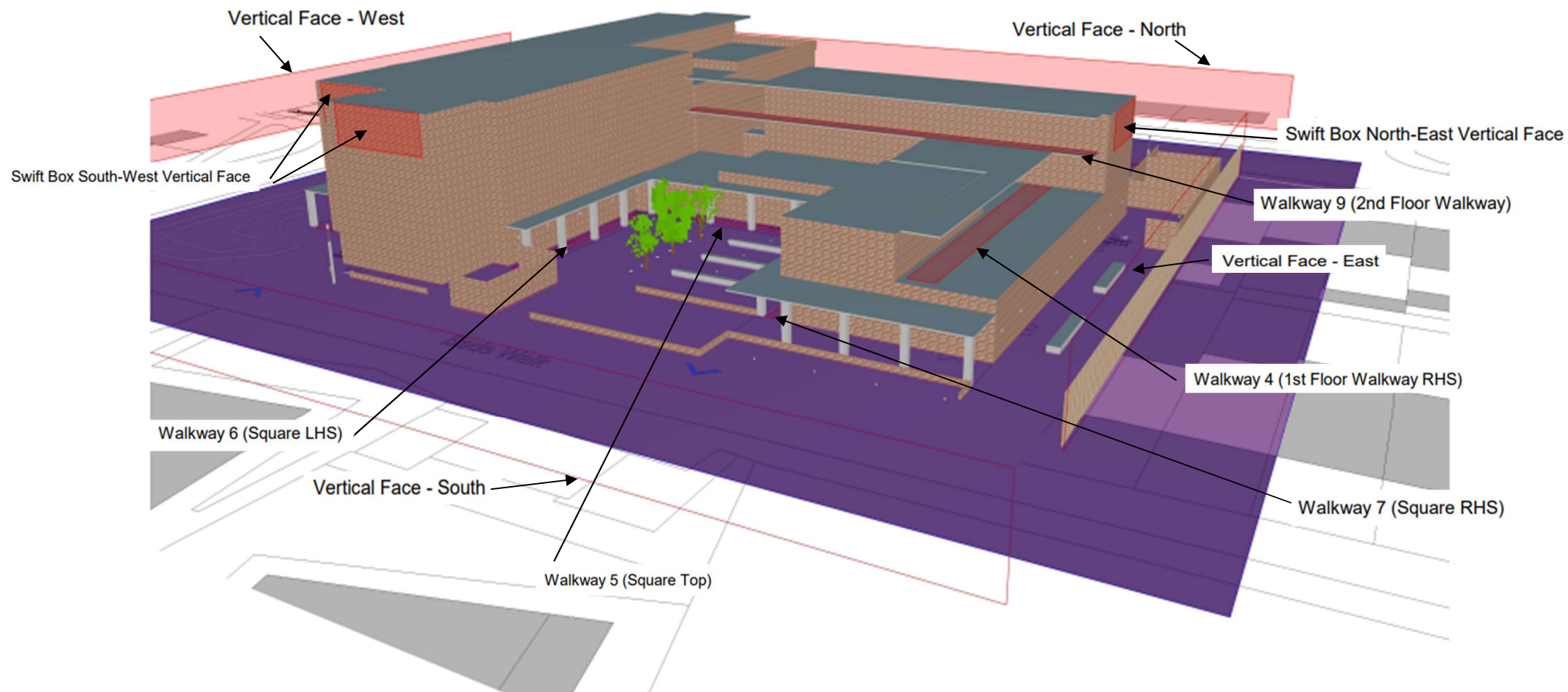
EXTERNAL LIGHTING 6a REDUCED OUTPUT (PRE-CURFEW) LIGHTING DESIGN



Plan View – External Lighting 6a - Reduced Output (Pre-Curfew) - Showing calculation boundary zone box and vertical and horizontal lines that represent the adjacent properties.



Plan View – External Lighting 6a - Reduced Output (Pre-Curfew) - Showing calculation boundary zone box and vertical and horizontal lines that represent the adjacent properties. These vertical illuminance faces are used in calculation of the Isolux layout show the light trespass.



Hexham Road – 3D view - Exterior Lighting 6a Reduced output (Pre-curfew)

EXTERNAL LIGHTING 6a - REDUCED OUTPUT (PRE-CURFEW) – MASTER TRESPASS/ SPILL LIGHT CALCULATIONS

We have provided Relux calculations which show Isolux lines at ground level from the whole installation based on the reduced output pre curfew lighting level.

A copy of the Isolux contour map that shows overall plan of the external lighting levels across the site of the ground floor, the map shows the light spill levels down to 1 lux, in relation with adjacent properties when operating between the pre curfew hours of 07.00hrs and 23.00 hrs.

It can be seen from the Isolux distribution that the lighting levels will comfortably comply with the requirements of BS 12464-2 i.e., 10 Lux.

An Isolux contour map showing light spillage/ light trespass to 1 Lux.

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Spill Light/ Light Trespass East Elevation

2.2.4 Table, Spill Light - East (E)

[m]	(0)	(0)	(0)	0.74	0.66	0.7
55	(0)	(0)	(0)	1.09	0.77	0.78
	(0)	(0)	(0)	1.13	0.88	0.87
50	(0)	(0)	(0)	0.77	0.86	0.94
	(0)	(0)	(0)	0.61	0.84	0.95
45	(0)	(0)	(0)	0.73	0.92	0.99
	(0)	(0)	(0)	1.09	1.13	1.1
40	(0)	(0)	(0)	1.33	1.38	1.24
	(0)	(0)	(0)	1.76	1.77	1.52
35	(0)	(0)	(0)	2.68	2.47	2.09
	(0)	(0)	(0)	3.63	3.29	2.97
30	(0)	(0)	(0)	4.58	3.87	3.37
	(0)	(0)	(0)	[4.75]	3.99	3.54
25	0.01	(0)	(0)	4.73	3.99	3.57
	(0)	(0)	(0)	4.64	3.91	3.49
20	0.01	(0)	(0)	4.38	3.69	3.32
	0.02	(0)	(0)	4.05	3.41	3.08
15	(0)	(0)	(0)	3.71	3.14	2.8
	(0)	(0)	(0)	3.35	2.83	2.49
10	(0)	(0)	(0)	2.93	2.47	2.15
	0.01	(0)	(0)	2.54	2.12	1.85
5	(0)	(0)	(0)	2.17	1.78	1.53
0	(0)	(0)	(0)	1.7	1.42	1.24
	0.0	1.0	2.0	3.0	4.0	5.0 [m]

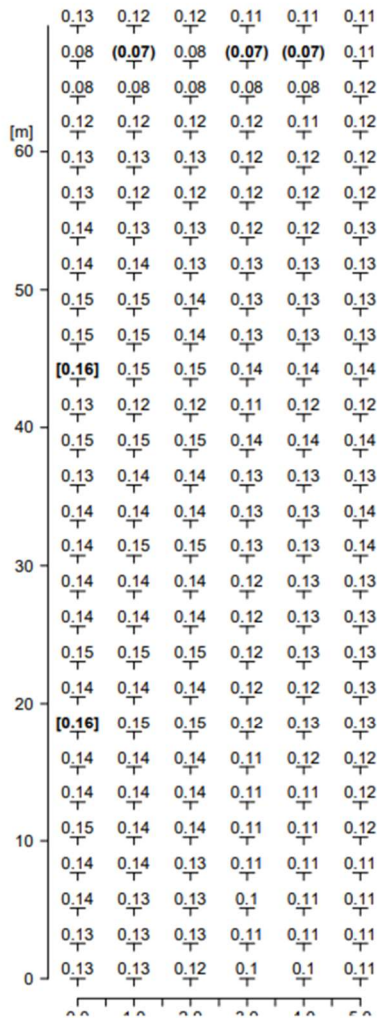


Location Plan

Average illuminance	Eav	: 1.14 lx
Minimum illuminance	Emin	: 0 lx
Maximum illuminance	Emax	: 4.75 lx
Uniformity Uo	Emin/Eav	: ---
Diversity Ud	Emin/Emax	: ---

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Spill Light/ Light Trespass West Elevation

2.2.5 Table, Spill Light - West (E)



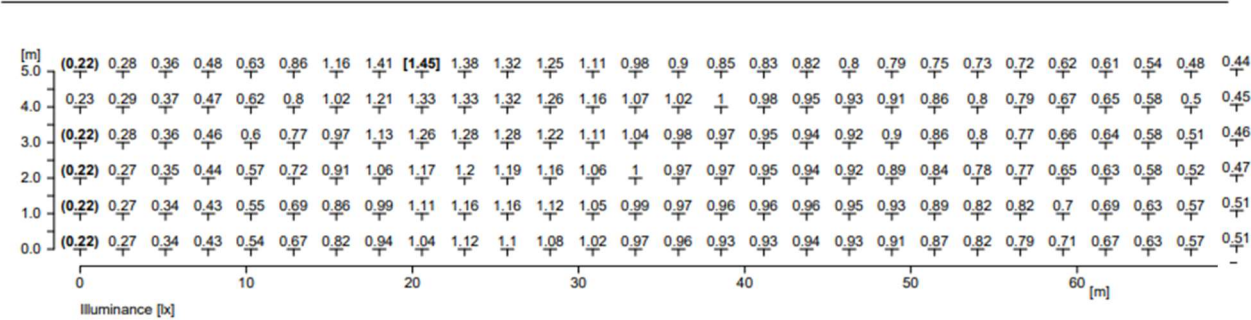
Location Plan

Average illuminance
Minimum illuminance
Maximum illuminance
Uniformity U_o
Diversity U_d

Eav : 0.13 lx
Emin : 0.07 lx
Emax : 0.16 lx
Emin/Eav : 1 : 1.76 (0.57)
Emin/Emax : 1 : 2.15 (0.46)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Spill Light/ Light Trespass South Elevation

2.2.6 Table, Spill Light - South (E)

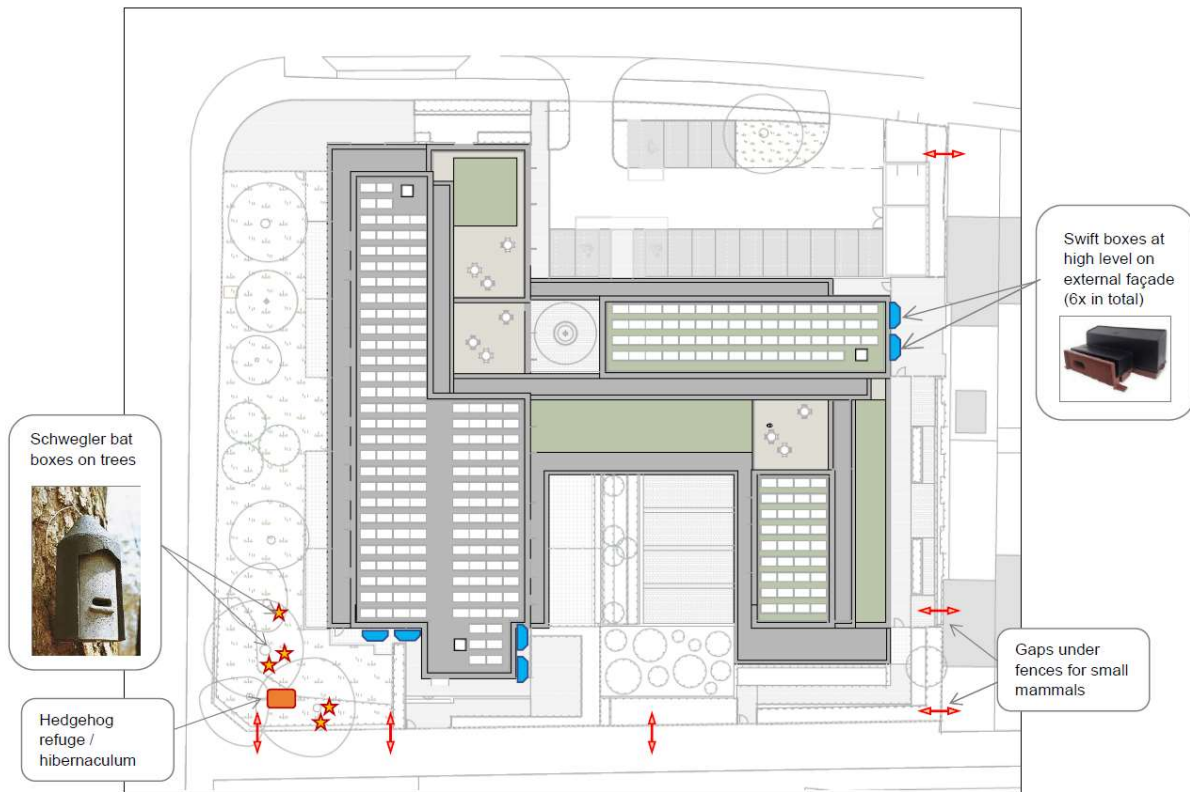


Average illuminance	Eav	: 0.81 lx
Minimum illuminance	Emin	: 0.22 lx
Maximum illuminance	Emax	: 1.45 lx
Uniformity Uo	Emin/Eav	: 1 : 3.72 (0.27)
Diversity Ud	Emin/Emax	: 1 : 6.69 (0.15)

LIGHTING CALCULATIONS ASSOCIATED WITH SWIFT BOXES, BAT BOXES AND OTHER WILDLIFE

Proposed Bat & Swift Box Locations

Plan showing location of Swift boxes, bat boxes and other wildlife around the site complete with associated vertical illuminance calculations for the north-east, south-west elevations. We have also added calculations at high level showing the vertical illuminance levels on the Northeast corner and on the Southwest corner of the building as this is where the swift boxes are located.



(Extract of elevation showing swift boxes, below, Nr G/L 20)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – South-West Vertical Face 1 at 10m AFFL

Please see below Relux calculations showing the vertical illumination level of the South-west corner of the building. The coverage zone or measuring area of the wall calculation is 6000mm x 3000mm. The swift boxes installed to the elevation would be typically mounted at 9000mm AFFL. Please refer to page 15 of this report for location of swift and bat boxes.

2.2.2 Table, SW Vertical Face 1 (10m) (E)

[m]	0.11	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.1	(0.08)
2.50	0.12	0.12	0.12	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11	0.11	(0.08)
2.25	0.13	0.13	0.13	0.13	0.13	0.14	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.09
2.00	0.13	0.14	0.14	0.14	0.14	0.15	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.09
1.75	0.14	0.15	0.15	0.15	0.15	0.16	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.1
1.50	0.15	0.16	0.16	0.16	0.16	0.17	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.11
1.25	0.16	0.17	0.17	0.17	0.17	[0.18]	0.17	0.17	0.17	0.17	0.17	0.16	0.16	0.12
1.00														
0.75														
0.50														
0.25														
0.00														
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	[m]	
	Illuminance [lx]													



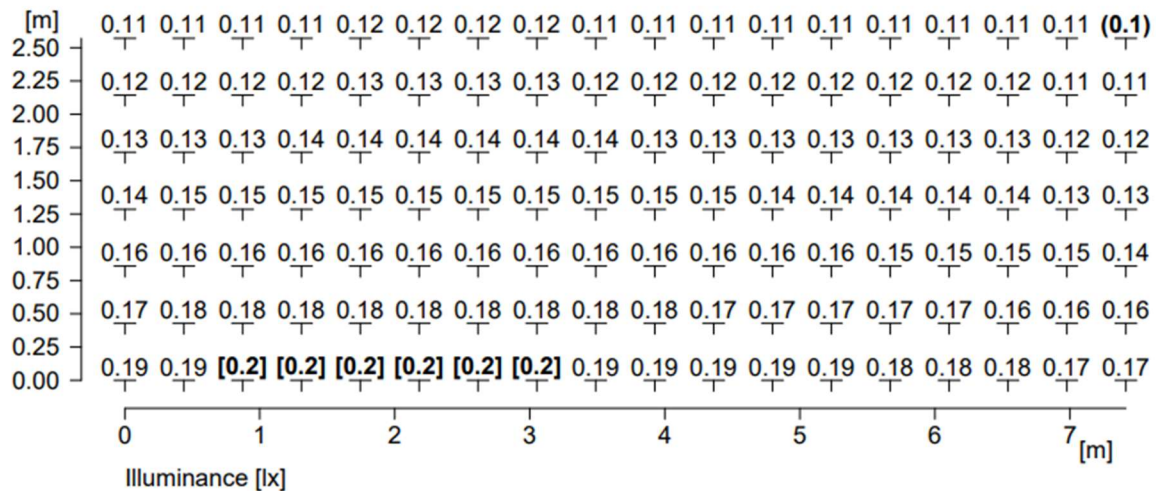
Location Plan

Average illuminance	Eav	: 0.14 lx
Minimum illuminance	Emin	: 0.08 lx
Maximum illuminance	Emax	: 0.18 lx
Uniformity Uo	Emin/Eav	: 1 : 1.79 (0.56)
Diversity Ud	Emin/Emax	: 1 : 2.37 (0.42)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – South-West Vertical Face 2 at 10m AFFL

Please see below Relux calculations showing the vertical illumination level of the South-west corner of the building. The coverage zone or measuring area of the wall calculation is 8000mm x 3000mm. The swift boxes installed to the elevation would be typically mounted at 9000mm AFFL. Please refer to page 15 of this report for location of swift and bat boxes.

2.2.3 Table, SW Vertical Face 2 (10m) (E)



Location Plan

Average illuminance	Eav	: 0.15 lx
Minimum illuminance	Emin	: 0.1 lx
Maximum illuminance	Emax	: 0.2 lx
Uniformity Uo	Emin/Eav	: 1 : 1.42 (0.71)
Diversity Ud	Emin/Emax	: 1 : 1.90 (0.53)

Vertical Face Bird & Bat Boxes Conclusion (Pre curfew)

As can be seen the lux levels in the locations of the bat & swift boxes are suitable to support the proposed bird wildlife. The calculated average illuminance on the vertical face of the South-West face is 0.14 & 0.15 lux respectively for vertical face 1 and 2. whereas on the NE vertical face the calculated illuminance is 0.52 lux.

Regarding, heights it is understood bat boxes will need to be installed at around 9 and 5m high respectively. The bat boxes will be mounted to the tree trunks and mounted as high as possible.

EXTERIOR LIGHTING 6a REDUCED OUTPUT (PRE- CURFEW) – WALKWAY LIGHTING CALCULATIONS

Drawings and the accompanying manufacturer's calculations and data sheets, show the pre -curfew lighting scheme for the:

Ground floor - Car park and pedestrian entrance lighting

Ground floor – Courtyard and walkways lighting

First floor - Walkway lighting

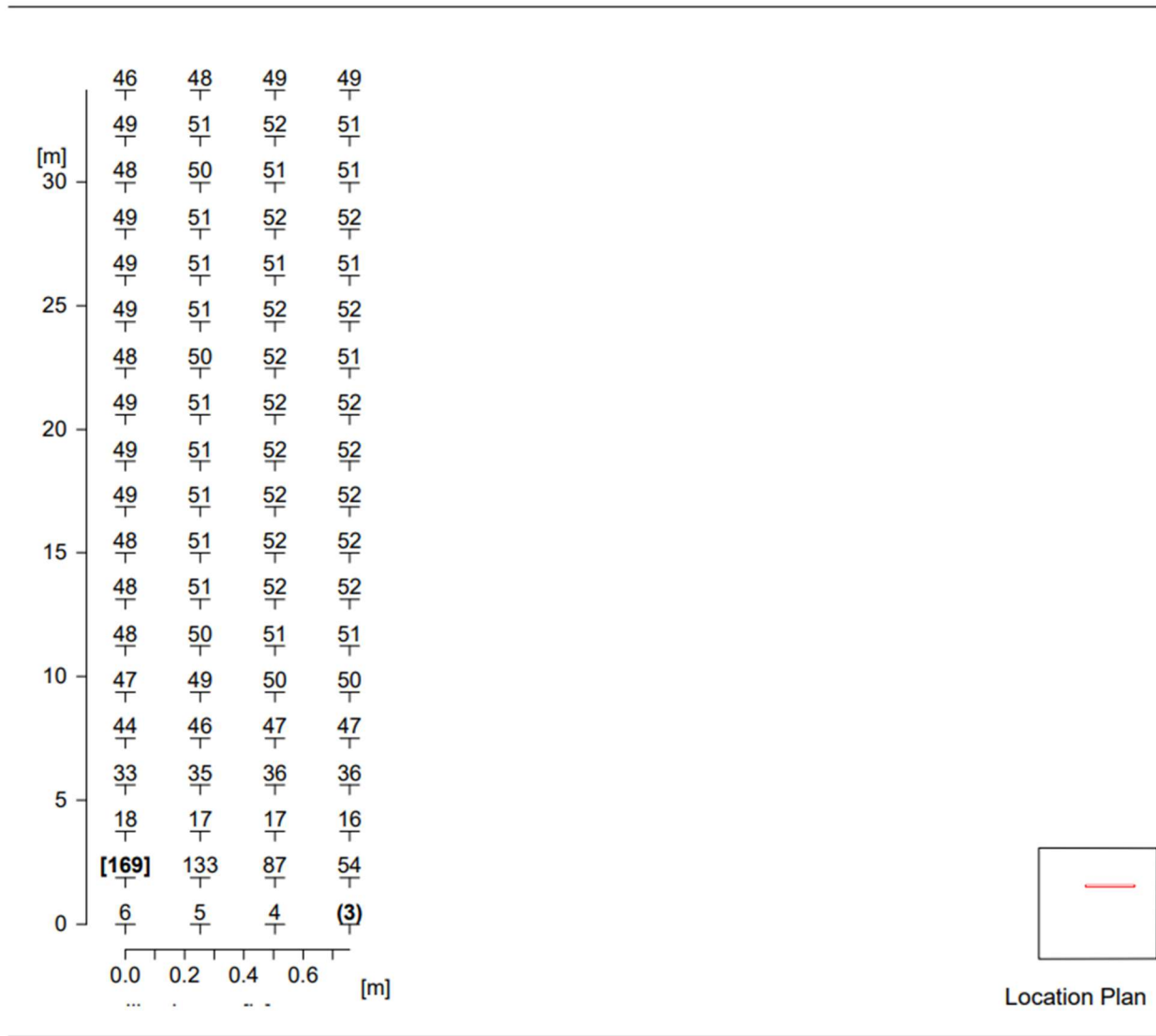
Second floor – Walkway lighting

Third floor - Walkway and terraces lighting

With the illuminance levels shown throughout the site and at the boundaries. The calculation model was prepared using industry standard software, Relux. It shows that adequate levels of lighting have been achieved on the site with minimal effect on the surrounding area, as required by the various standards.

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 1 (Top Walkway) Lighting Level

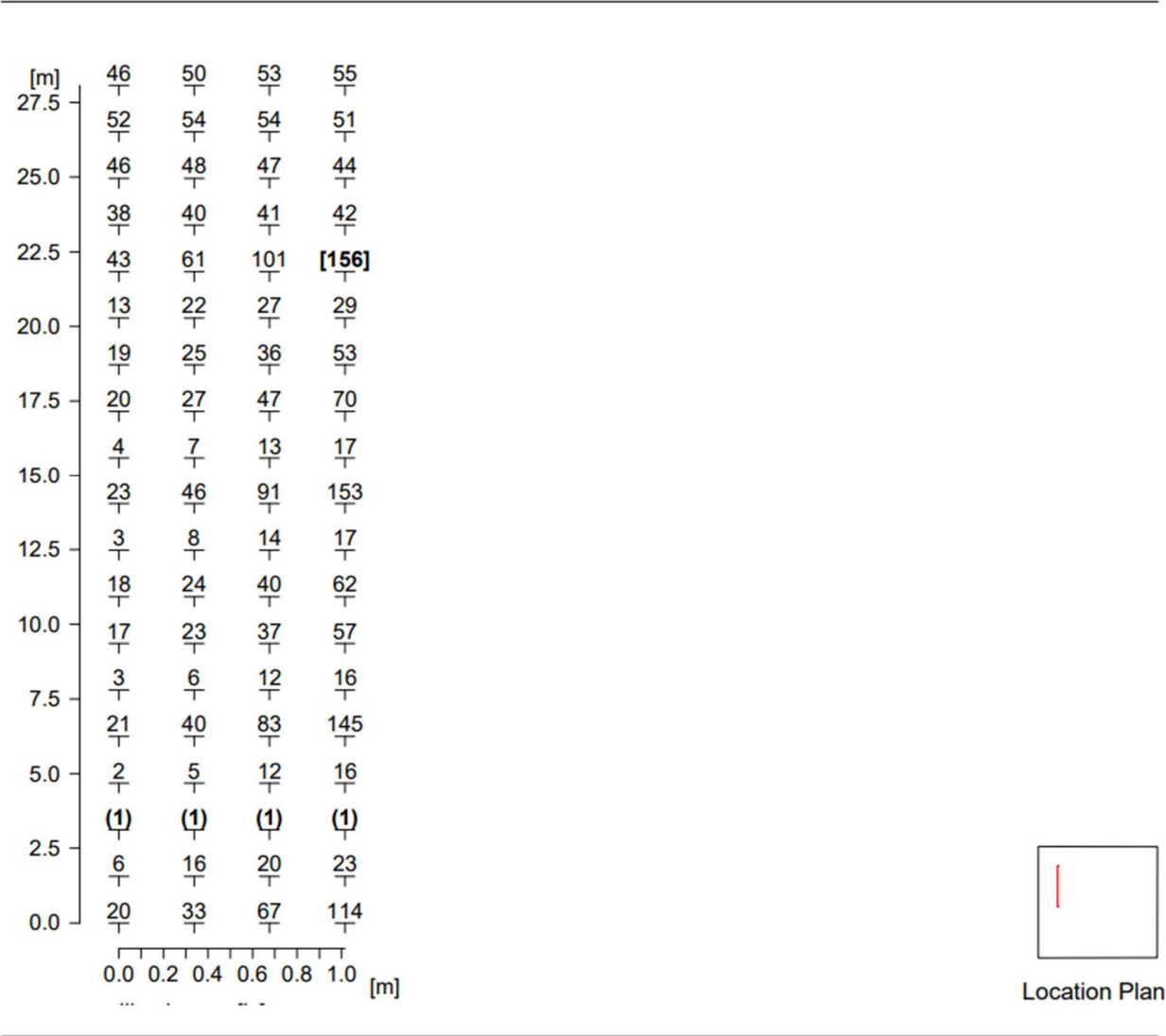
2.2.15 Table, Walkway Ground level 0m (Top walkway) (E)



Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 48 lx
Minimum illuminance	Emin	: 3 lx
Maximum illuminance	Emax	: 169 lx
Uniformity Uo	Emin/Eav	: 1 : 13.93 (0.07)
Diversity Ud	Emin/Emax	: 1 : 48.79 (0.02)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 2 (LSH 1) Lighting Level

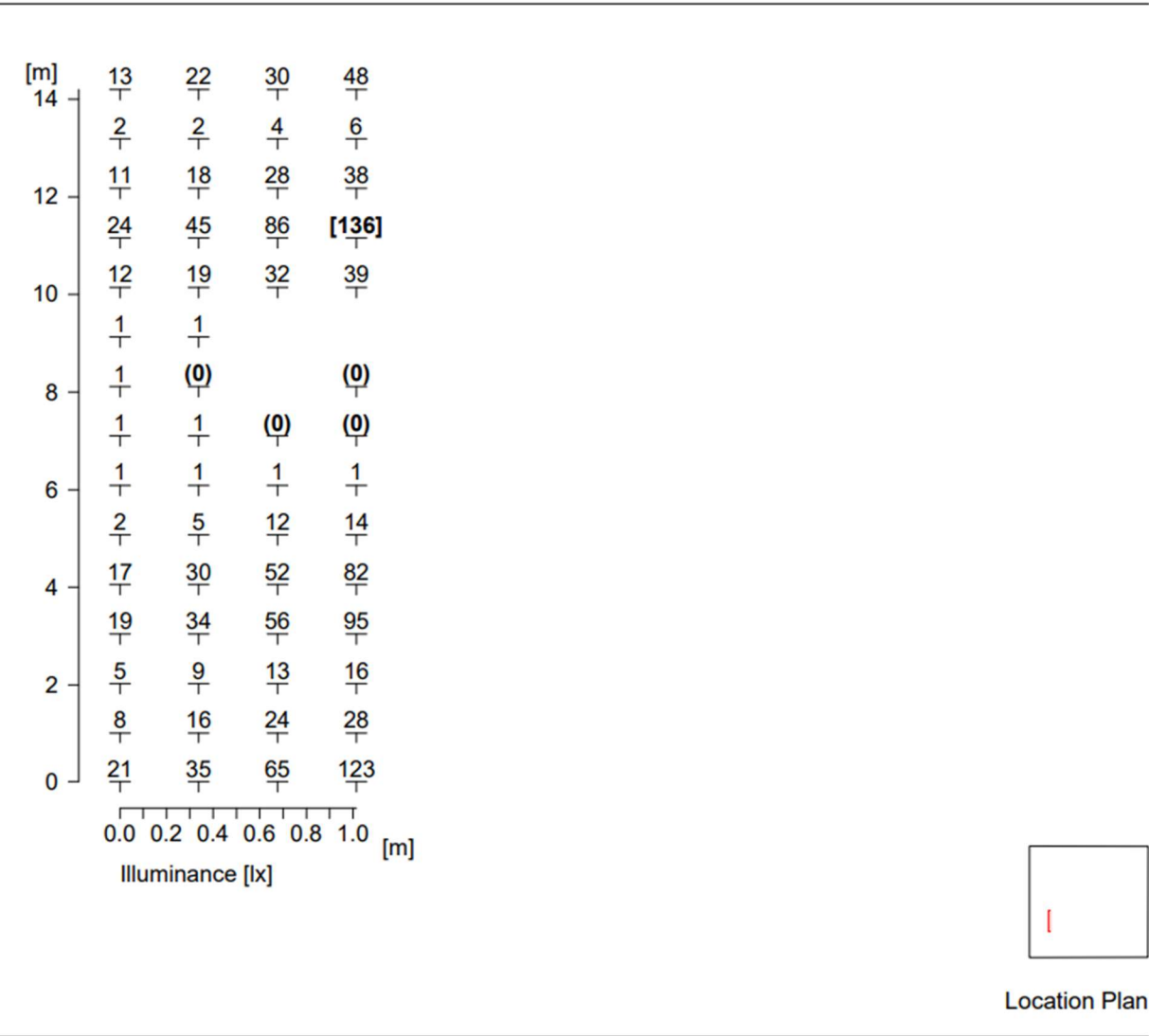
2.2.13 Table, Walkway Ground level 0m. LHS1 (E)



Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 37 lx
Minimum illuminance	Emin	: 1 lx
Maximum illuminance	Emax	: 156 lx
Uniformity Uo	Emin/Eav	: 1 : 33.16 (0.03)
Diversity Ud	Emin/Emax	: 1 : 137.77 (0.01)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 3 (LHS 2) Lighting Level

2.2.14 Table, Walkway Ground level 0m.LHS 2 (E)



Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 25 lx
Minimum illuminance	Emin	: 0 lx
Maximum illuminance	Emax	: 136 lx
Uniformity Uo	Emin/Eav	: 1 : 6423.70 (0.00)
Diversity Ud	Emin/Emax	: 1 : 35526.83 (0.00)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 4 (1st Floor RHS) Lighting Level (Lux)

2.2.8 Table, Walkway High level 4m. (E)

	58.3	57.2	55.4	52.8	49.4	45.1		
22	62.5	62.8	62.2	60.6	57.7	53.4		
	56.8	58.8	59.9	59.8	58.2	55		
20	52	53.9	56	56.9	56.2	53.8		
	[67.5]	63.6	54.7	54.8	54.5	52.5		
18	63.7	58.6	52.7	53.4	53.4	51.6		
	43.7	47.6	50.6	52.5	52.6	50.9		
16	42.6	46.7	50	51.9	52.2	50.6		
	42.7	46.8	49.9	51.8	52	50.4		
14	42.6	46.7	49.8	51.8	52	50.3		
	42.4	46.5	49.7	51.6	51.8	50.1		
12	42.4	46.4	49.6	51.5	51.7	50.1		
	42.3	46.4	49.5	51.4	51.6	50		
10	42.2	46.3	49.4	51.3	51.5	49.9		
	42.1	46.2	49.3	51.2	51.4	49.8		
8	42	46	49.2	51.1	51.3	49.6		
	41.8	45.9	49	50.9	51.1	49.4		
6	41.6	45.6	48.7	50.5	50.8	49.1		
	40.9	44.9	48	49.9	50.1	48.5		
4	39.7	43.7	46.7	48.6	48.8	47.2		
	37.4	41.3	44.2	46	46.2	44.6		
2	33	36.4	39.1	40.7	40.9	39.5		
0	(25.7)	28.2	30.2	31.4	31.6	30.5		
	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4



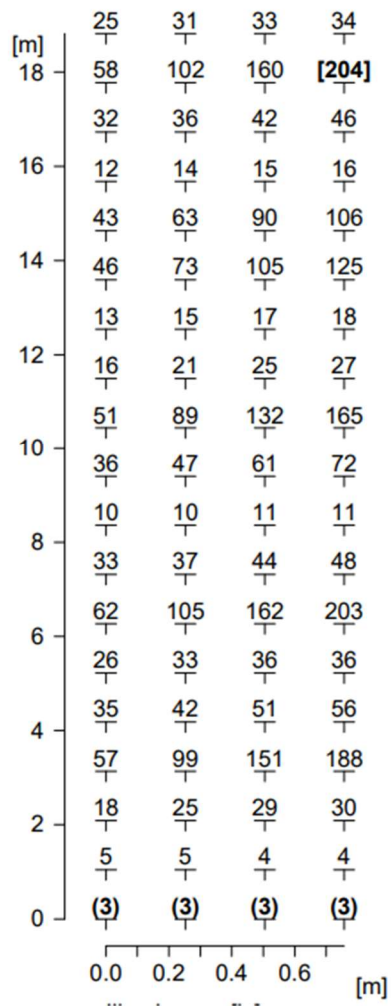
Location Plan

Height of the reference plane

Average illuminance	Eav	: 49 lx
Minimum illuminance	Emin	: 25.7 lx
Maximum illuminance	Emax	: 67.5 lx
Uniformity Uo	Emin/Eav	: 1 : 1.91 (0.52)
Diversity Ud	Emin/Emax	: 1 : 2.63 (0.38)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 5 (Square top) Lighting Level

2.2.12 Table, Walkway Ground level 0m.(Square Top) (E)



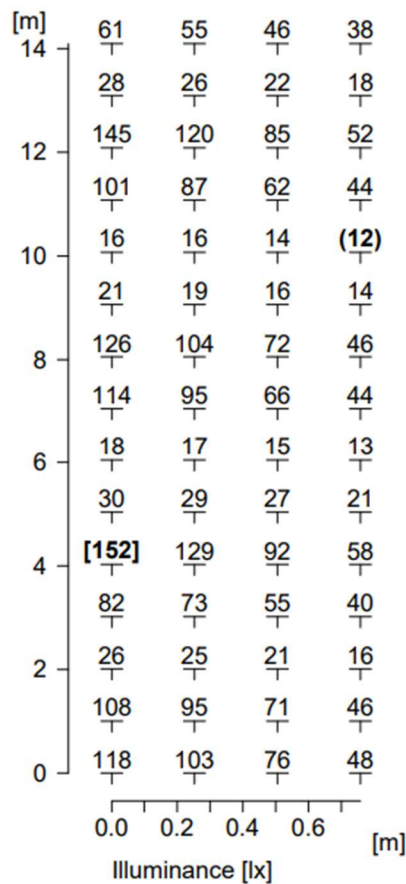
Location Plan

Height of the reference plane

Average illuminance	Eav	: 0.00 m
Minimum illuminance	Emin	: 53 lx
Maximum illuminance	Emax	: 3 lx
Uniformity Uo	Emin/Eav	: 204 lx
Diversity Ud	Emin/Eav	: 1 : 18.01 (0.06)
	Emin/Emax	: 1 : 69.79 (0.01)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 6 (Square LHS) Lighting Level

2.2.11 Table, WalkwayGround level 0m.(Square LHS) (E)

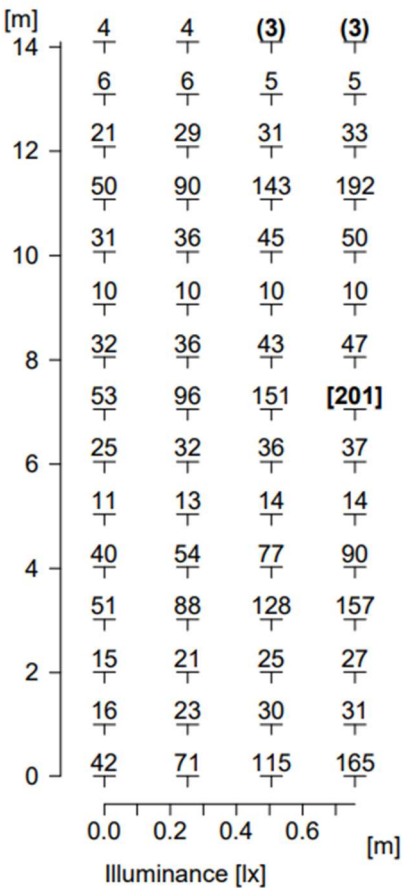


Location Plan

Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 57 lx
Minimum illuminance	Emin	: 12 lx
Maximum illuminance	Emax	: 152 lx
Uniformity Uo	Emin/Eav	: 1 : 4.73 (0.21)
Diversity Ud	Emin/Emax	: 1 : 12.70 (0.08)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 7 (Square RHS) Lighting Level (Lux)

2.2.10 Table, Walkway Ground level 0m.(Square RHS) (E)

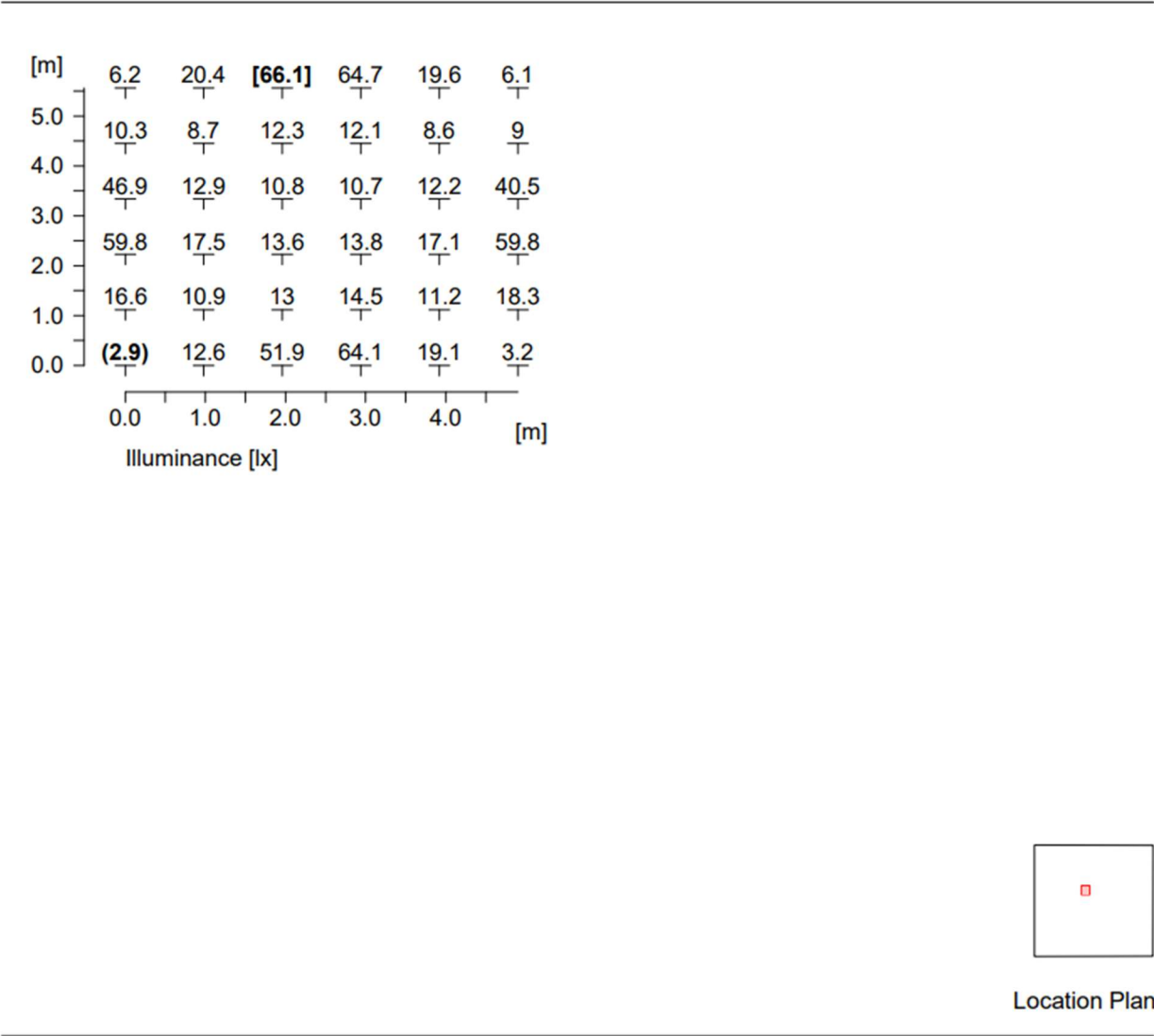


Location Plan

Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 49 lx
Minimum illuminance	Emin	: 3 lx
Maximum illuminance	Emax	: 201 lx
Uniformity Uo	Emin/Eav	: 1 : 18.22 (0.05)
Diversity Ud	Emin/Emax	: 1 : 74.88 (0.01)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 8 (Open Square) Lighting Level

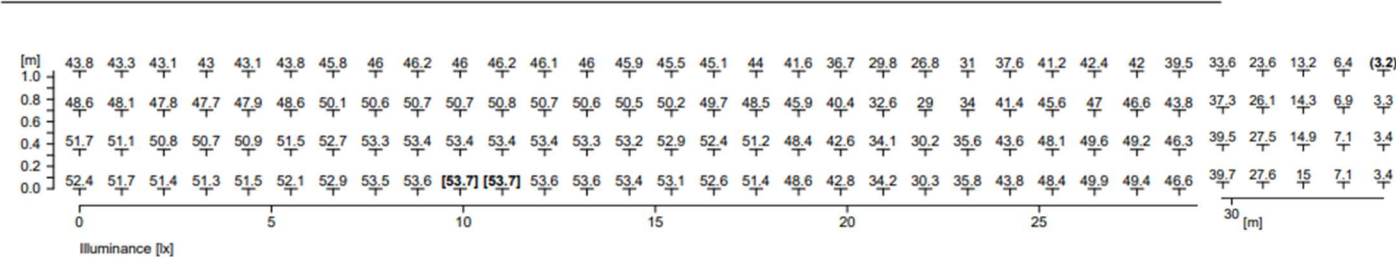
2.2.16 Table, Open Square Ground level (E)



Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 22.2 lx
Minimum illuminance	Emin	: 2.9 lx
Maximum illuminance	Emax	: 66.1 lx
Uniformity Uo	Emin/Eav	: 1 : 7.68 (0.13)
Diversity Ud	Emin/Emax	: 1 : 22.91 (0.04)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Walkway 9 (1st Floor) Lighting Level (Lux)

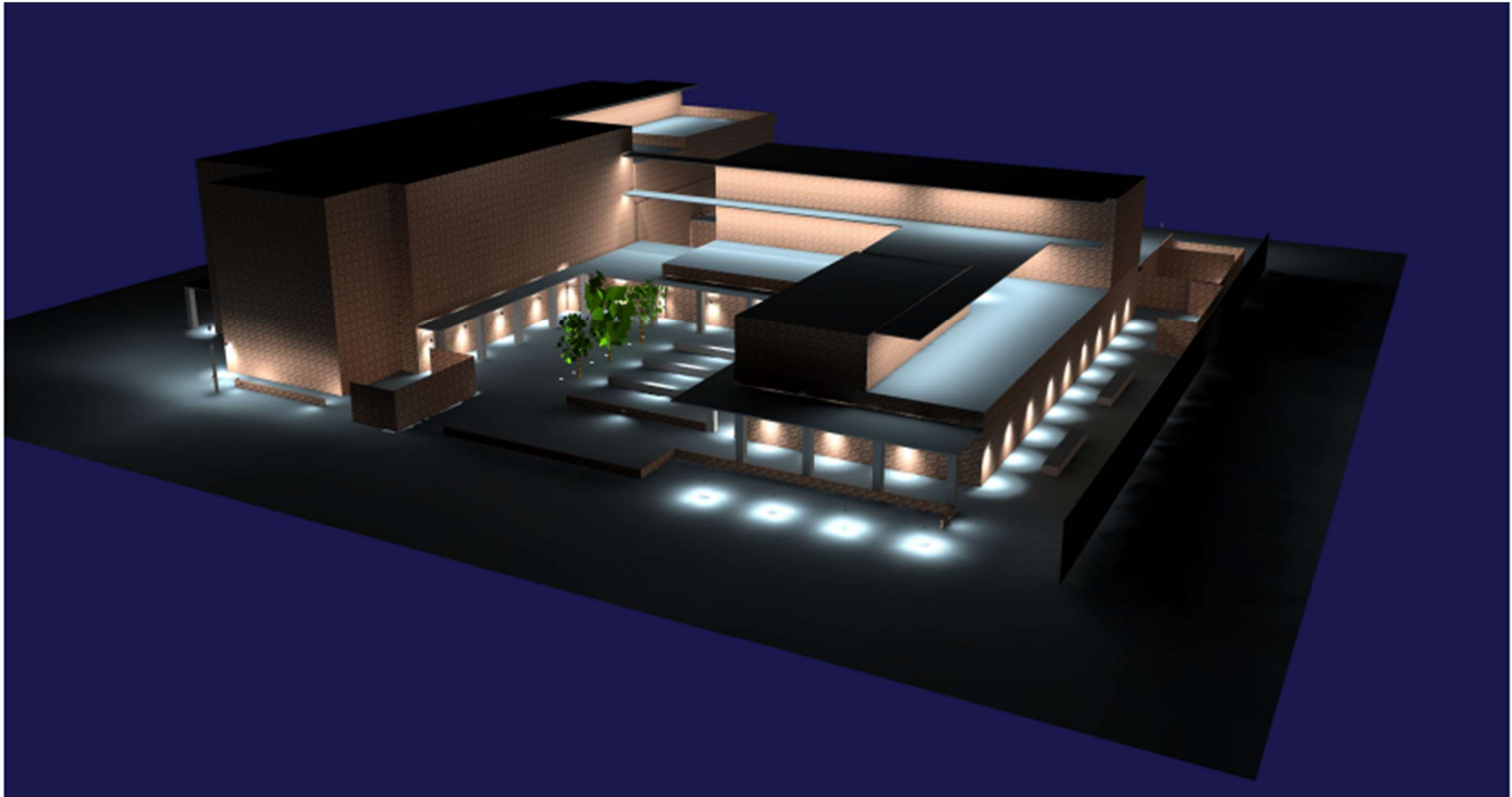
2.2.9 Table, Walkway High Level 7m. (E)



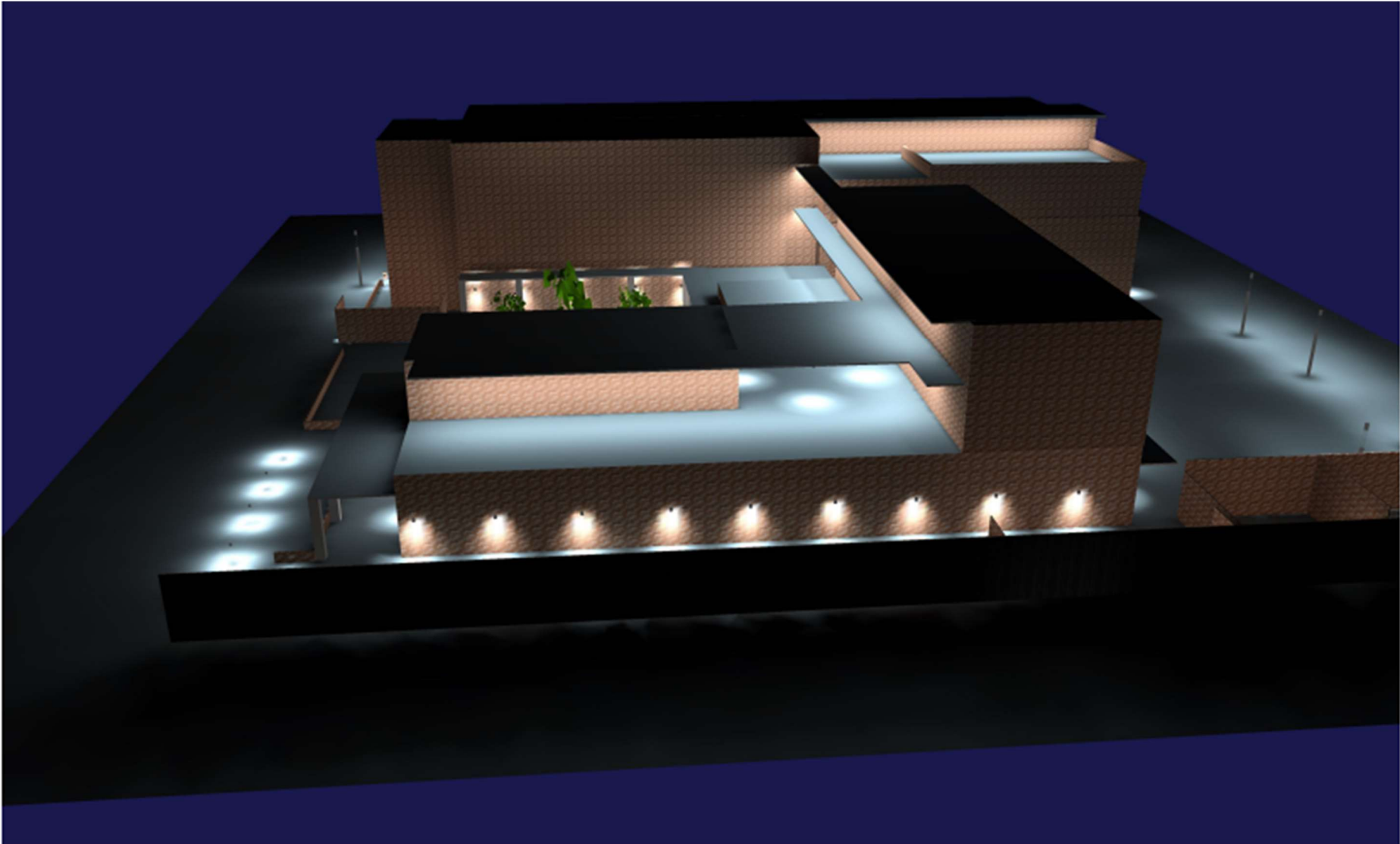
Location Plan

Height of the reference plane		: 7.15 m
Average illuminance	Eav	: 42 lx
Minimum illuminance	Emin	: 3.2 lx
Maximum illuminance	Emax	: 53.7 lx
Uniformity Uo	Emin/Eav	: 1 : 13.29 (0.08)
Diversity Ud	Emin/Emax	: 1 : 16.98 (0.06)

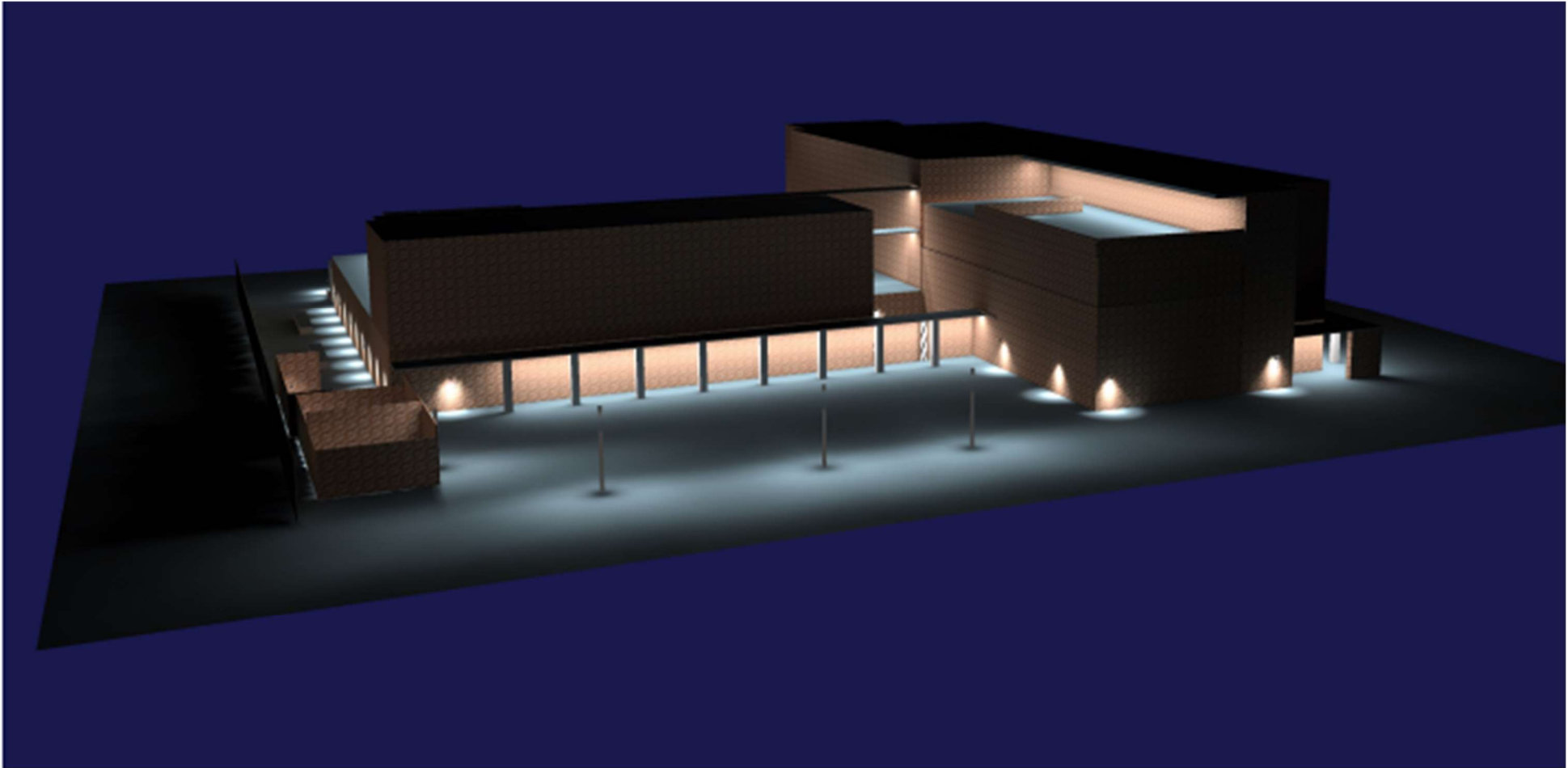
EXTERIOR LIGHTING 6a REDUCED OUTPUT (PRE-CURFEW) – 3D VIEWS



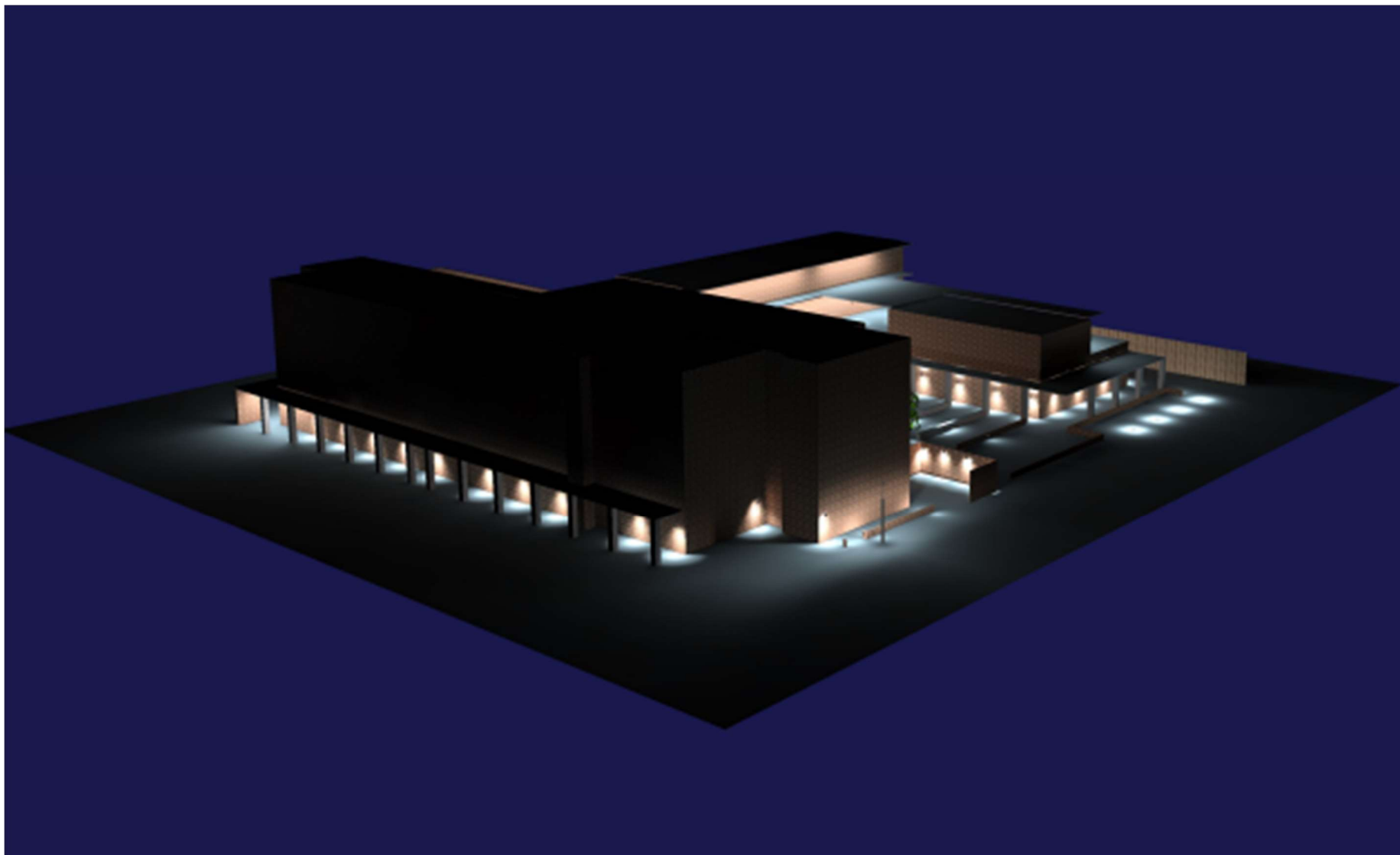
Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew)
Calculation Results – 3D Illuminance View - Looking South-East (Bede Walk & Neighbouring property)



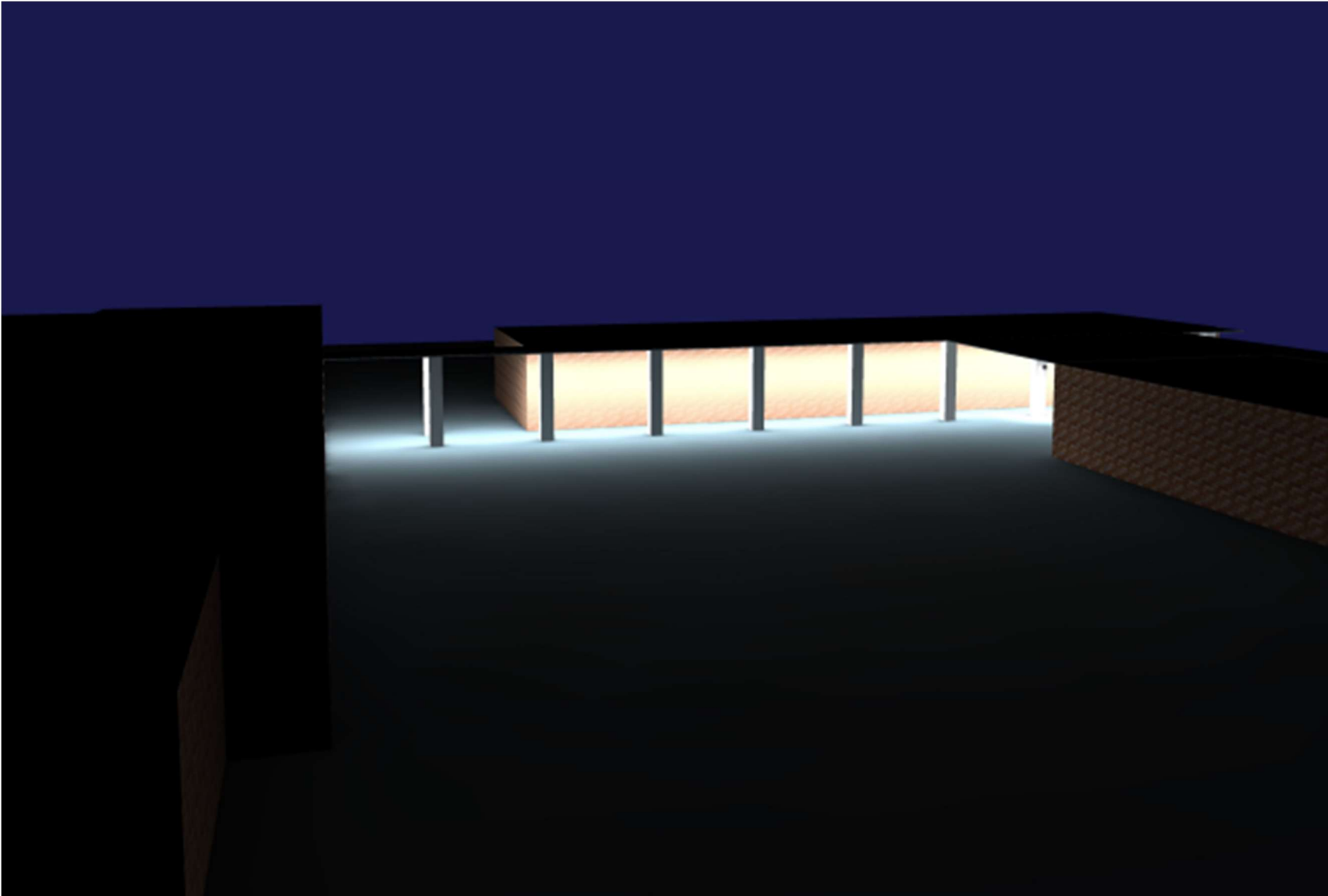
Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew)
Calculation Results – 3D Illuminance View - Looking East (Neighbouring Property)



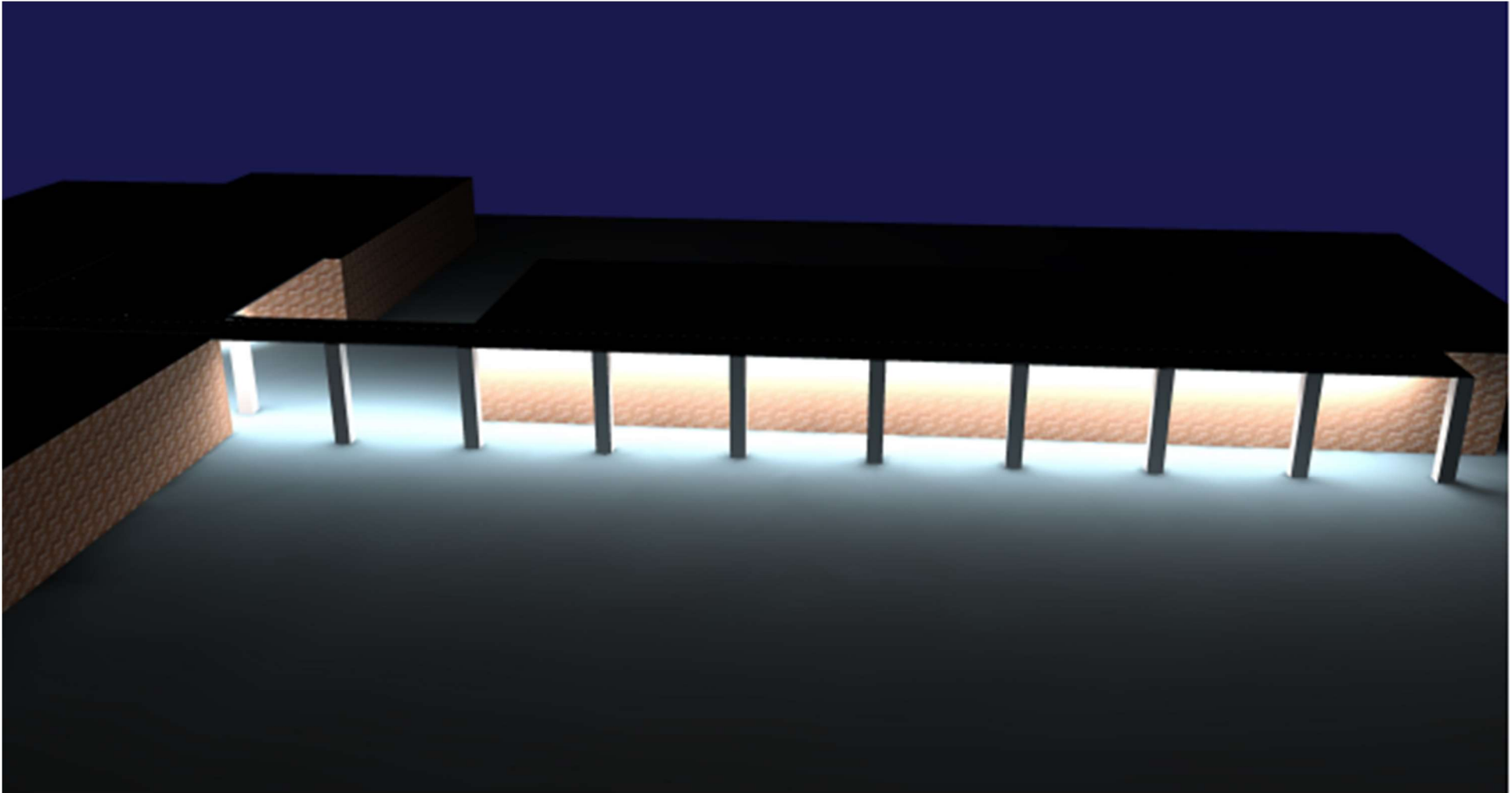
Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew)
Calculation Results – 3D Illuminance View - Looking North (Hexham Road) (Carpark & Pedestrian Entrance)



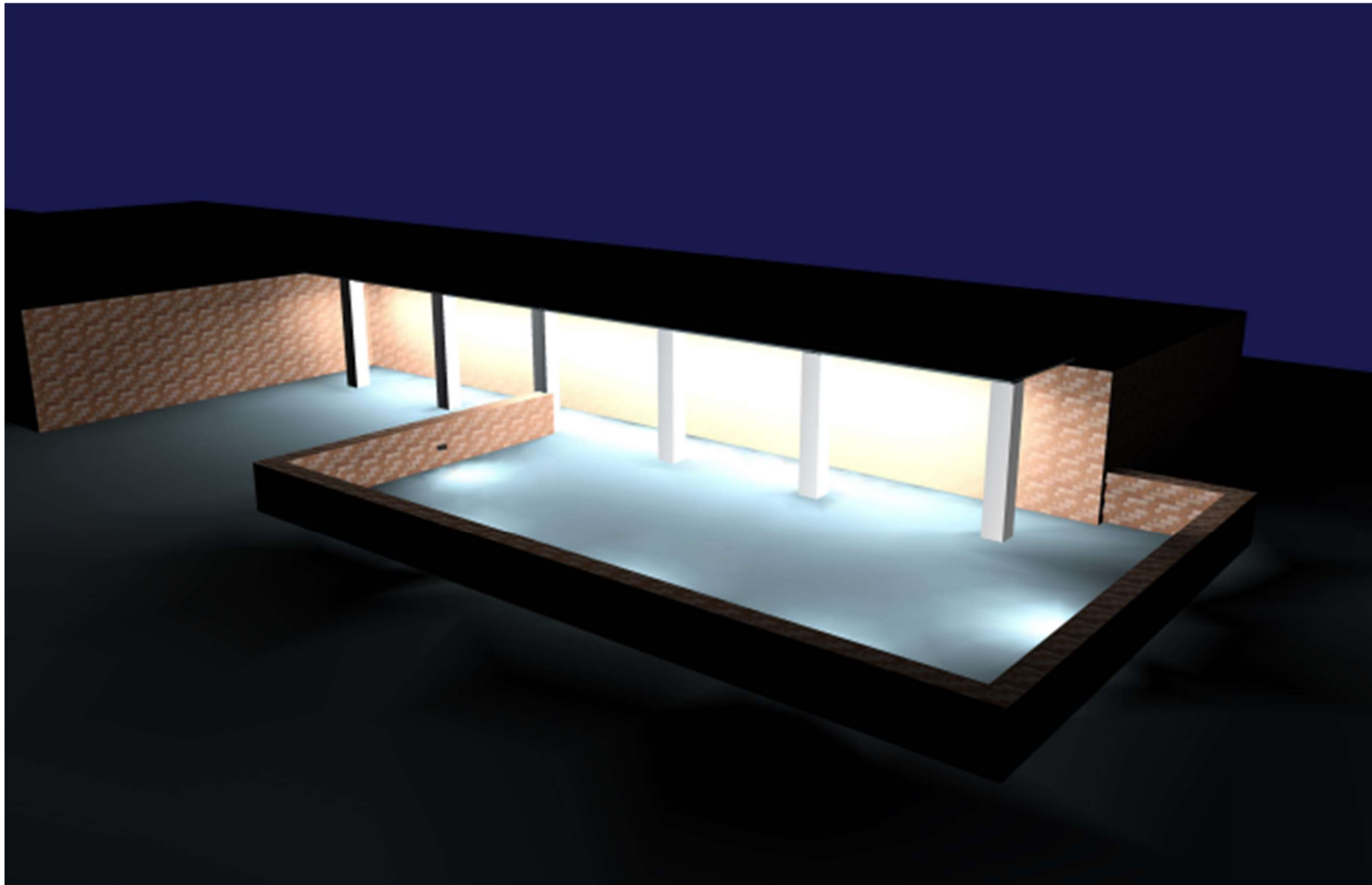
Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew)
Calculation Results – 3D Illuminance View - Looking South – West (Northumberland Ave. & Bede Walk)



Exterior Lighting 6a Reduced Output (Pre- Curfew)
First Floor Walkway Lighting View – 3D Illuminance – Looking North -East

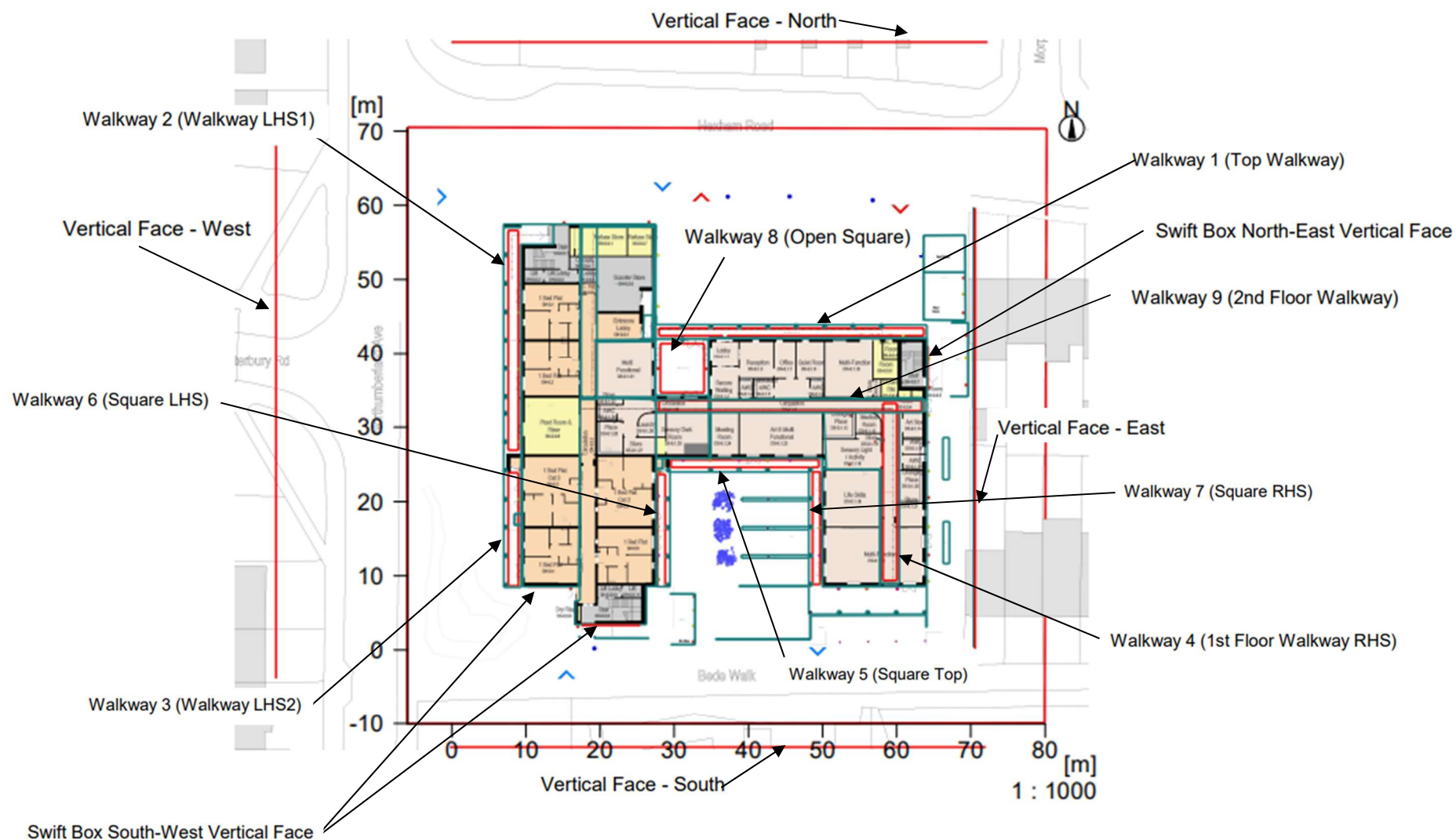


Exterior Lighting 6a Reduced Output (Pre- Curfew)
Second Floor Walkway Lighting View – 3D Illuminance – Looking North-East

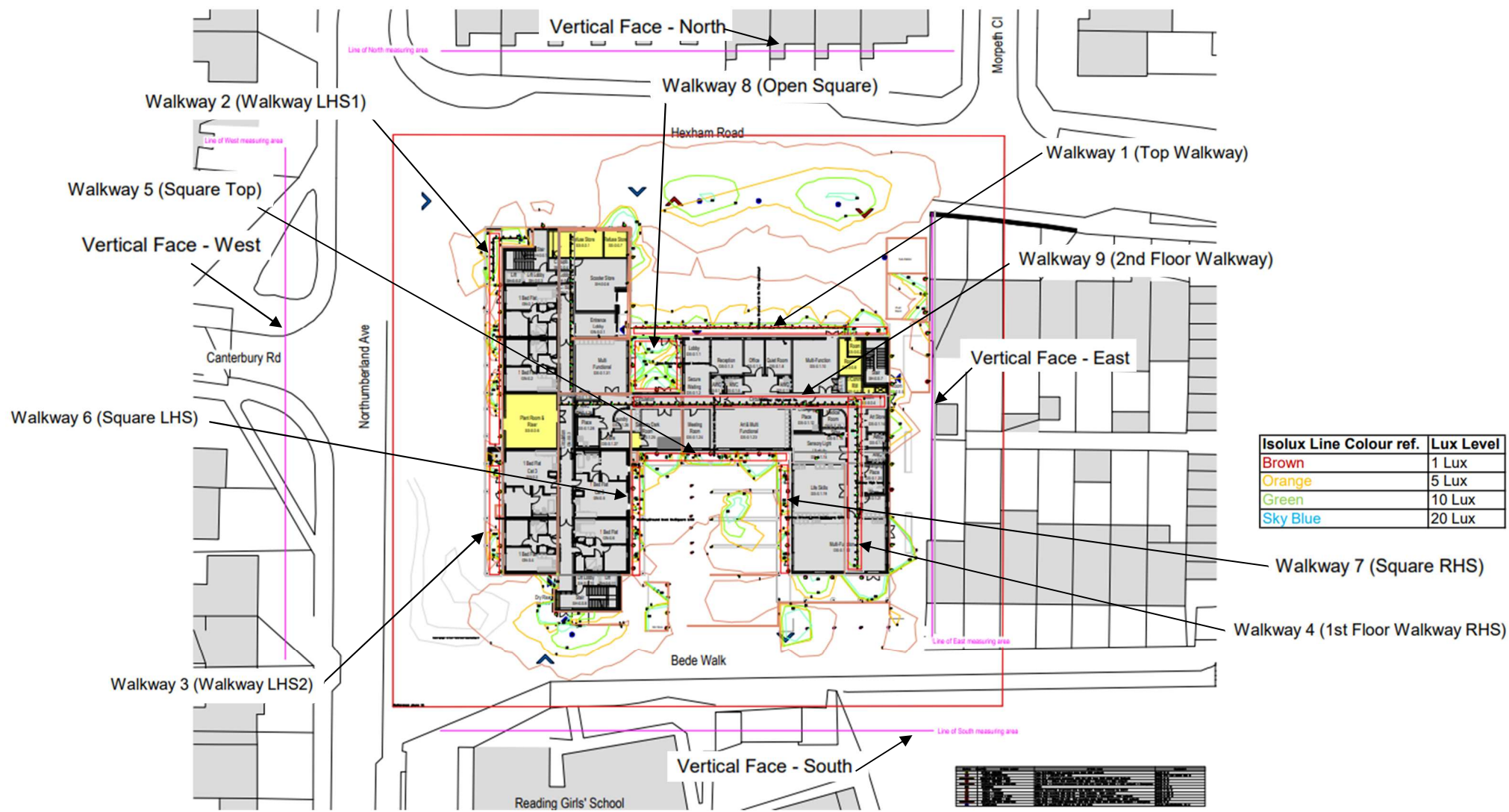


Exterior Lighting 6a Reduced Output (Pre- Curfew)
Third Floor Walkway & Terrace Lighting View – 3D Illuminance – Looking South-West

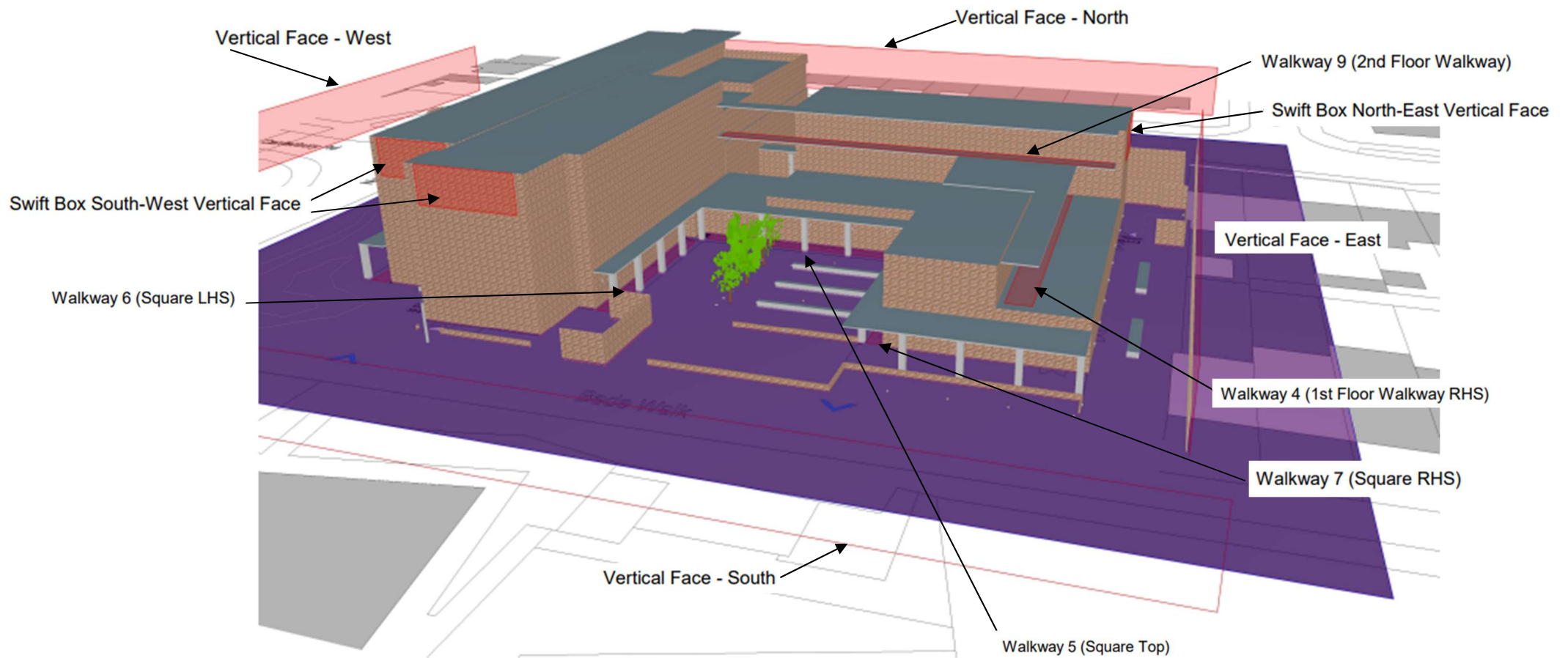
EXTERNAL LIGHTING 6b SECURITY LIGHTING POST-CURFEW LIGHTING DESIGN



Plan View – External Lighting 6b – Security Lighting (Post-Curfew) - Showing calculation boundary zone box and vertical and horizontal lines that represent the adjacent properties.



Plan View – External Lighting 6b – Security Lighting (Post-Curfew) - Showing calculation boundary zone box and vertical and horizontal lines that represent the adjacent properties. These vertical illuminance faces are used in calculation of the Isolux layout show the light trespass. It can be seen that in security lighting mode the 1 lux Isolux is now closer to the premises due to the lower light level not radiating as far as with the reduced output pre-curfew model.



EXTERNAL LIGHTING 6b – SECURITY LIGHTING (POST-CURFEW) – MASTER TRESPASS/ SPILL LIGHT CALCULATIONS

We have provided Relux calculations which show Isolux lines at ground level from the whole installation based on the reduced output lighting level (post-curfew)

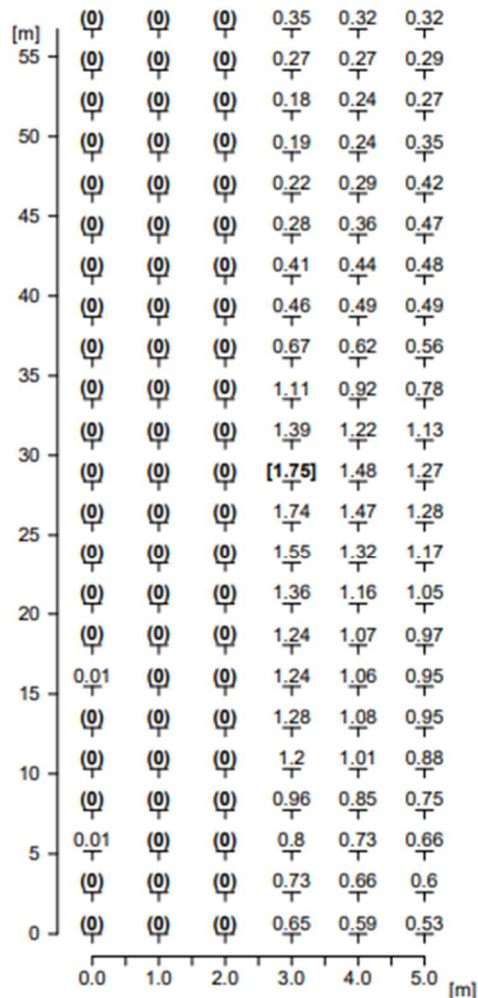
A copy of the Isolux contour map that shows overall plan of the external lighting levels across the site of the ground floor, the map shows the light spill levels down to 1 lux, in relation with adjacent properties when operating between the post curfew hours of 23.00hrs and 07.00 hrs.

It can be seen from the Isolux distribution that by switching off the lighting in strategic locations and hence reducing the overall light level post curfew light levels will comfortably comply with the requirements of BS 12464-2

An Isolux contour map showing light spillage/ light trespass to 1 Lux.

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – Spill Light/ Light Trespass East Elevation

2.2.4 Table, Spill Light - East (E)

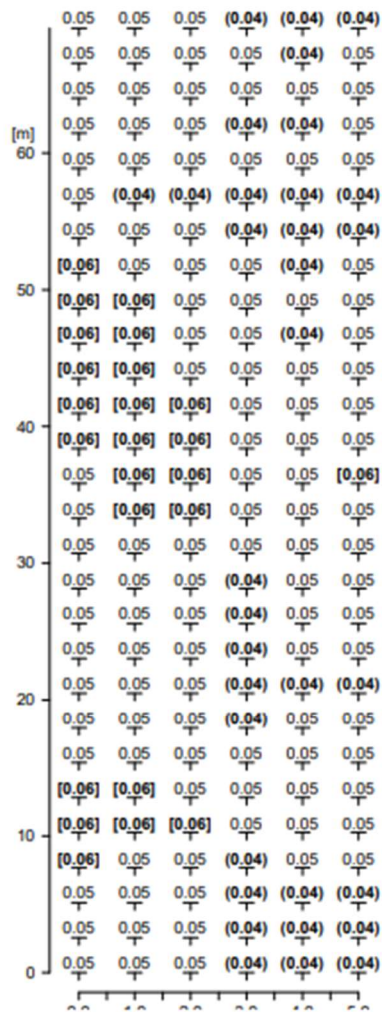


Location Plan

Average illuminance	Eav	: 0.4 lx
Minimum illuminance	Emin	: 0 lx
Maximum illuminance	Emax	: 1.75 lx
Uniformity Uo	Emin/Eav	: ---
Diversity Ud	Emin/Emax	: ---

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Spill Light/ Light Trespass West Elevation

2.2.5 Table, Spill Light - West (E)



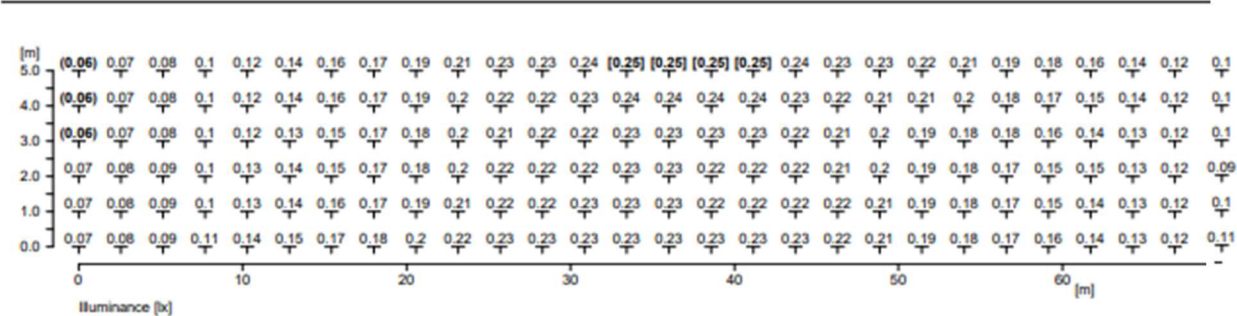
Location Plan

Average illuminance
Minimum illuminance
Maximum illuminance
Uniformity U_o
Diversity U_d

E_{av} : 0.05 lx
E_{min} : 0.04 lx
E_{max} : 0.06 lx
E_{min}/E_{av} : 1 : 1.23 (0.81)
E_{min}/E_{max} : 1 : 1.55 (0.65)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – Spill Light/ Light Trespass North Elevation

2.2.7 Table, Spill Light - North (E)



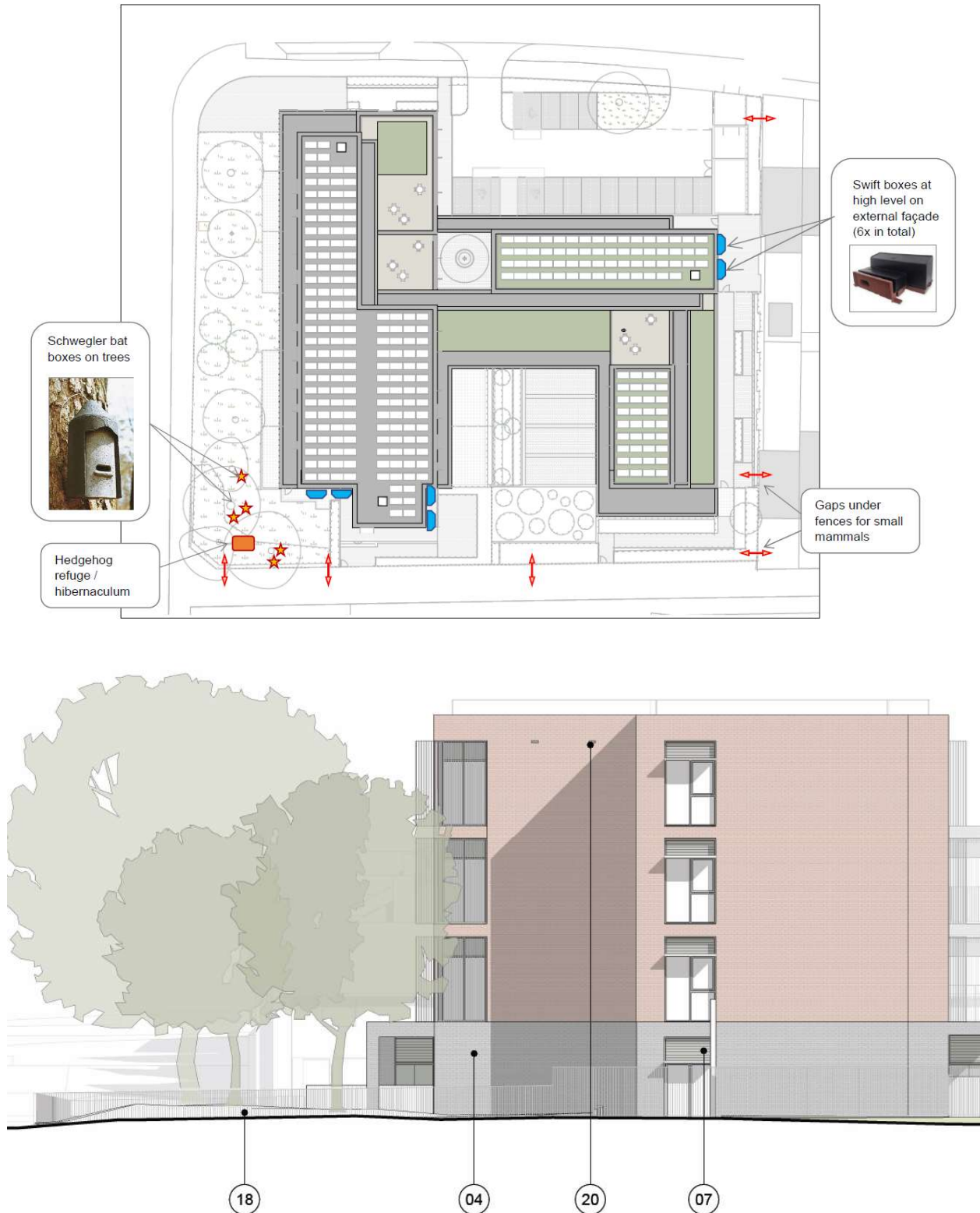
Location Plan

Average illuminance	Eav	: 0.17 lx
Minimum illuminance	Emin	: 0.06 lx
Maximum illuminance	Emax	: 0.25 lx
Uniformity Uo	Emin/Eav	: 1 : 2.82 (0.35)
Diversity Ud	Emin/Emax	: 1 : 4.12 (0.24)

**LIGHTING CALCULATIONS ASSOCIATED WITH SWIFT BOXES, BAT
BOXES AND OTHER WILDLIFE FOR 6b SECURITY LIGHTING
(POST CURFEW)**

Proposed Bat & Swift Box Locations (Post curfew)

Plan showing location of Swift boxes, bat boxes and other wildlife around the site complete with associated vertical illuminance calculations for the north-east, south-west elevations. We have also added calculations at high level showing the vertical illuminance levels on the Northeast corner and on the Southwest corner of the building as this is where the swift boxes are located.

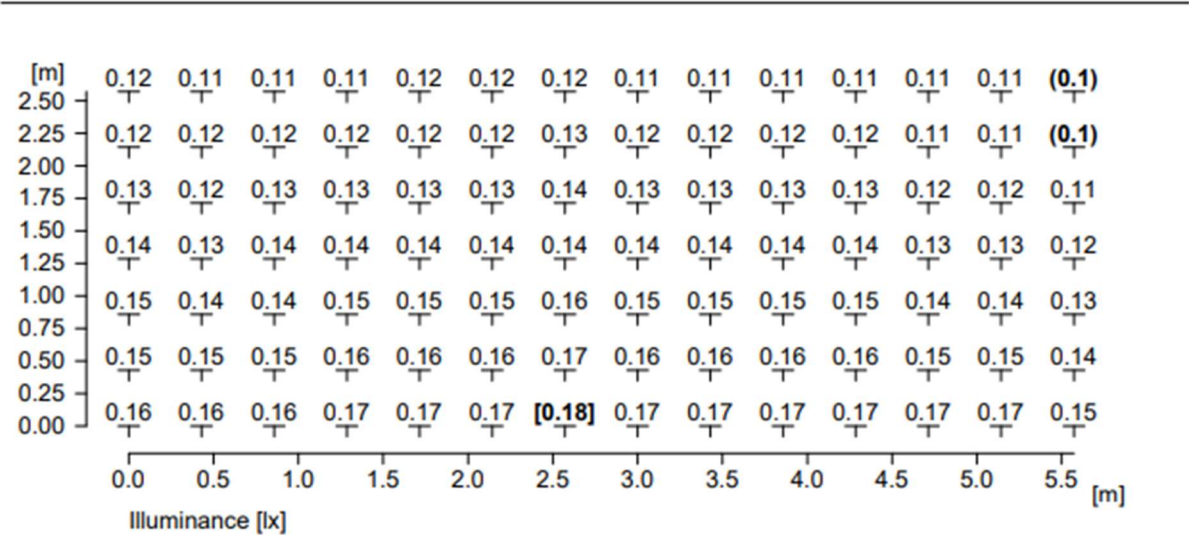


(Extract of elevation showing swift boxes, below, Nr G/L 20)

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – South-West Vertical Face 1 at 10m AFFL

Please see below Relux calculations showing the vertical illumination level of the South-west corner of the building. The coverage zone or measuring area of the wall calculation is 6000mm x 3000mm. The swift boxes installed to the elevation would be typically mounted at 9000mm AFFL. Please refer to page 55 of this report for location.

2.2.2 Table, SW Vertical Face 1 (10m) (E)



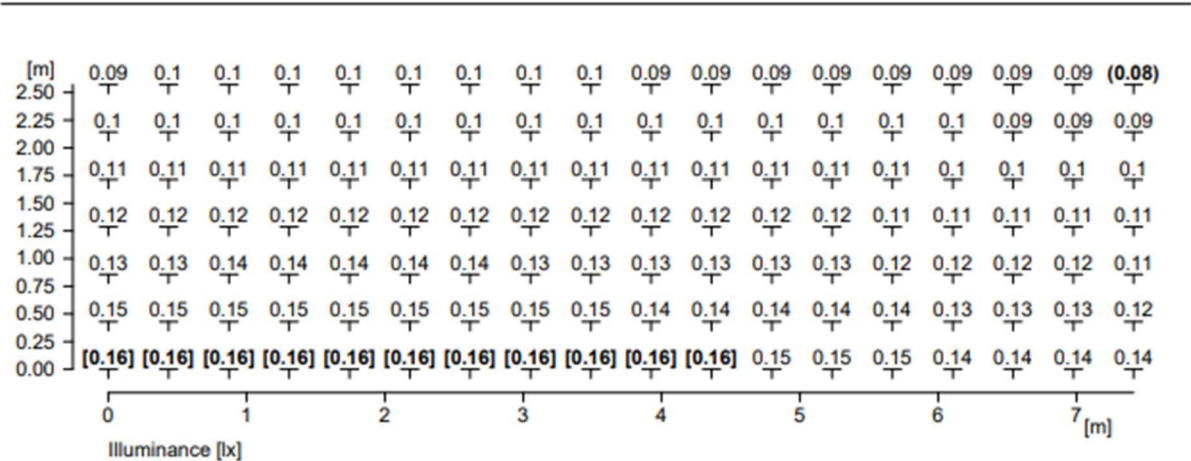
Location Plan

Average illuminance	Eav	: 0.14 lx
Minimum illuminance	Emin	: 0.1 lx
Maximum illuminance	Emax	: 0.18 lx
Uniformity Uo	Emin/Eav	: 1 : 1.42 (0.71)
Diversity Ud	Emin/Emax	: 1 : 1.84 (0.54)

Hexham Road – Exterior Lighting 6a Reduced Output (Pre- Curfew) Calculation Results – South-West Vertical Face 2 at 10m AFFL

Please see below Relux calculations showing the vertical illumination level of the South-west corner of the building. The coverage zone or measuring area of the wall calculation is 8000mm x 3000mm. The swift boxes installed to the elevation would be typically mounted at 9000mm AFFL. Please refer to page 55 of this report for location.

2.2.3 Table, SW Vertical Face 2 (10m) (E)



Location Plan

Average illuminance	Eav	: 0.12 lx
Minimum illuminance	Emin	: 0.08 lx
Maximum illuminance	Emax	: 0.16 lx
Uniformity Uo	Emin/Eav	: 1 : 1.44 (0.69)
Diversity Ud	Emin/Emax	: 1 : 1.95 (0.51)

Vertical Face Bird & Bat Boxes Conclusion (Post curfew)

As can be seen the lux levels in the locations of the bat & swift boxes are suitable to support the proposed bird wildlife. The calculated average illuminance on the vertical face of the South-West face is 0.14 & 0.12 lux respectively for vertical face 1 and 2. whereas on the NE vertical face the calculated illuminance is 0.17 lux.

Regarding, heights it is understood bat boxes will need to be installed at around 9 and 5m high respectively. The bat boxes will be mounted to the tree trunks and mounted as high as possible.

EXTERIOR LIGHTING 6b SECURITY LIGHTING (POST-CURFEW) - WALKWAY LIGHTING CALCULATIONS

Drawings and the accompanying manufacturer's calculations and data sheets, show the post -curfew lighting scheme for the:

Ground floor - Car park and pedestrian entrance lighting

Ground floor – Courtyard and walkways lighting

First floor - Walkway lighting

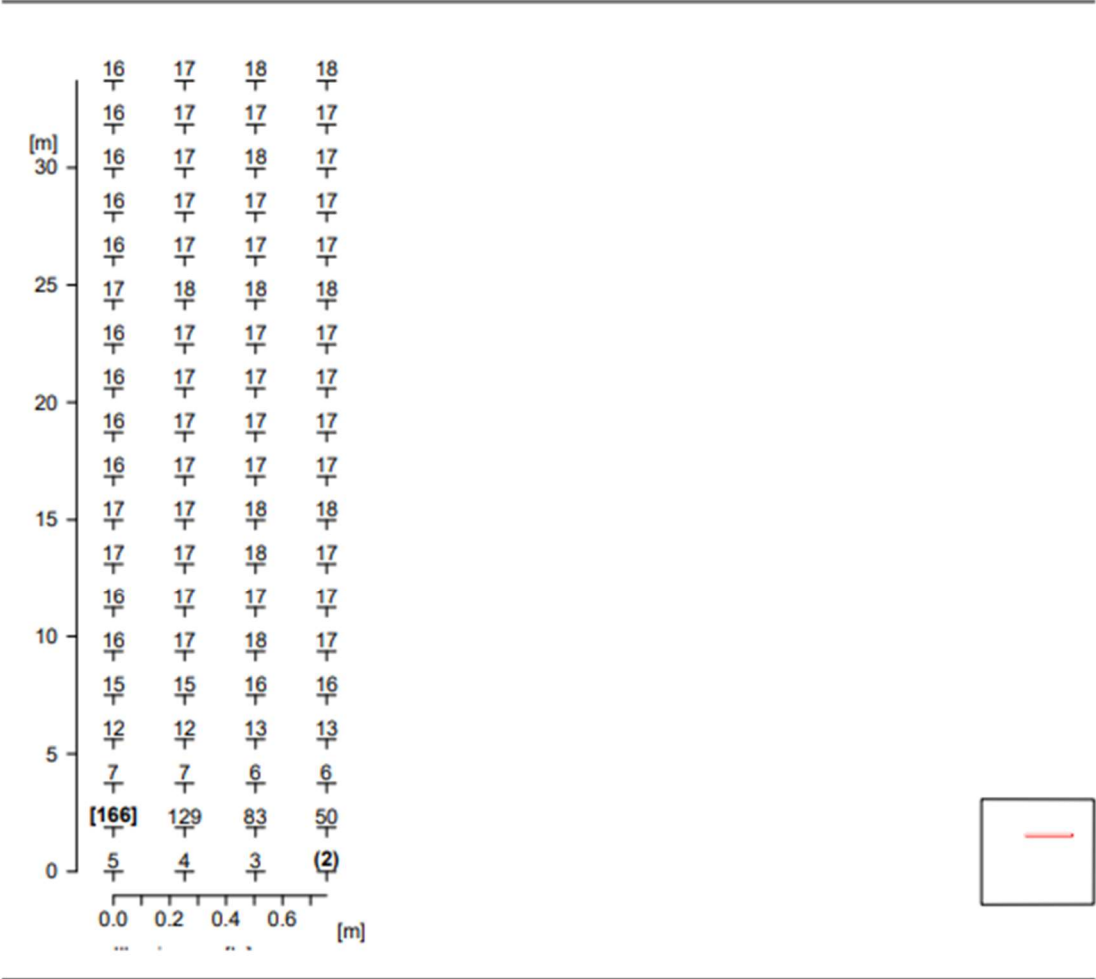
Second floor – Walkway lighting

Third floor - Walkway and terraces lighting

With the illuminance levels shown throughout the site and at the boundaries. The calculation model was prepared using industry standard software, Relux. It shows that adequate levels of lighting have been achieved on the site with minimal effect on the surrounding area, as required by the various standards.

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – Walkway 1 (Top Walkway) Lighting Level (Lux)

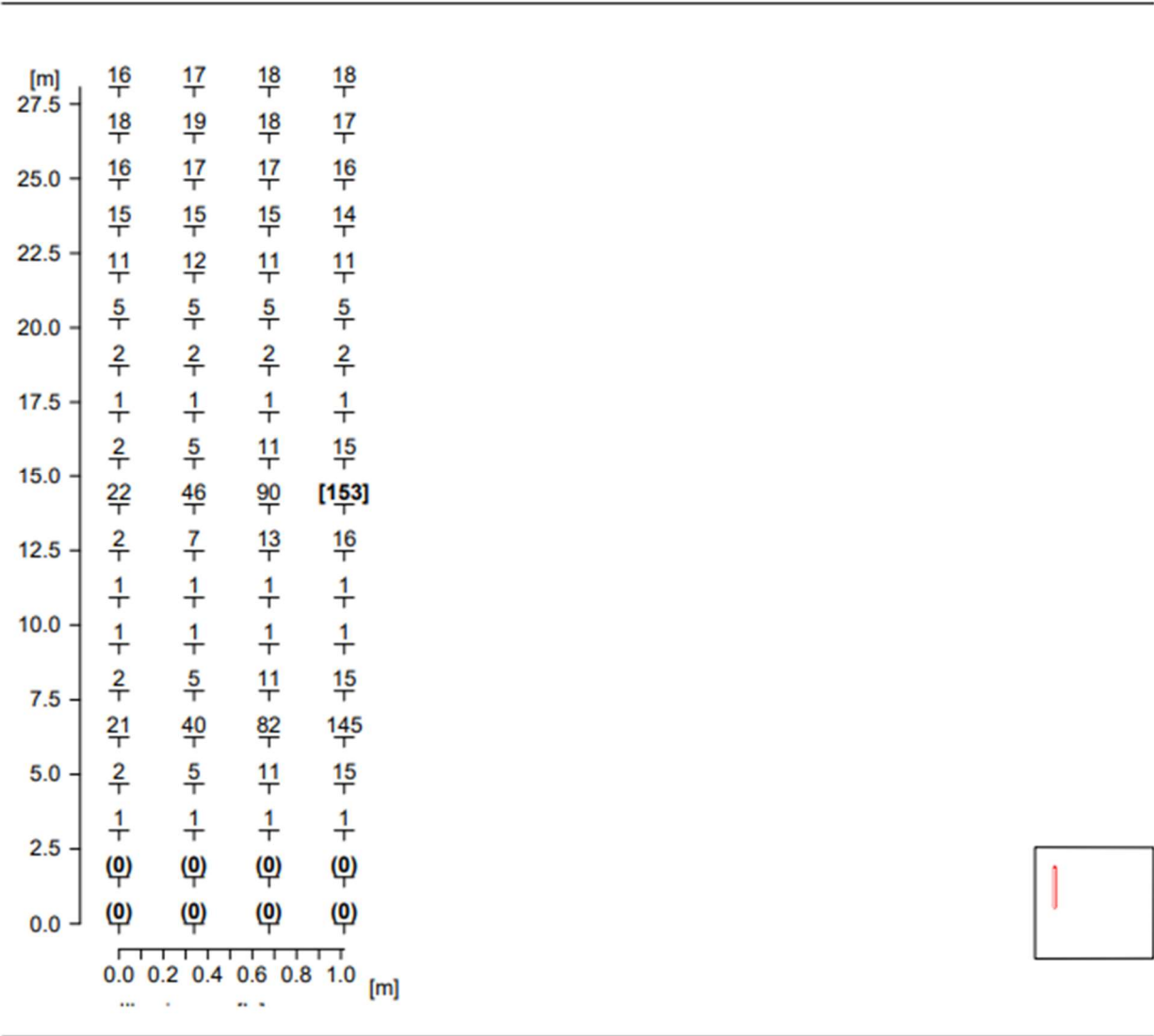
2.2.15 Table, Walkway Ground level 0m (Top wakkway) (E)



Height of the reference plane	: 0.00 m
Average illuminance	Eav : 20 lx
Minimum illuminance	Emin : 2 lx
Maximum illuminance	Emax : 166 lx
Uniformity Uo	Emin/Eav : 1 : 9.80 (0.10)
Diversity Ud	Emin/Emax : 1 : 80.43 (0.01)

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – Walkway 2 (LSH 1) Lighting Level

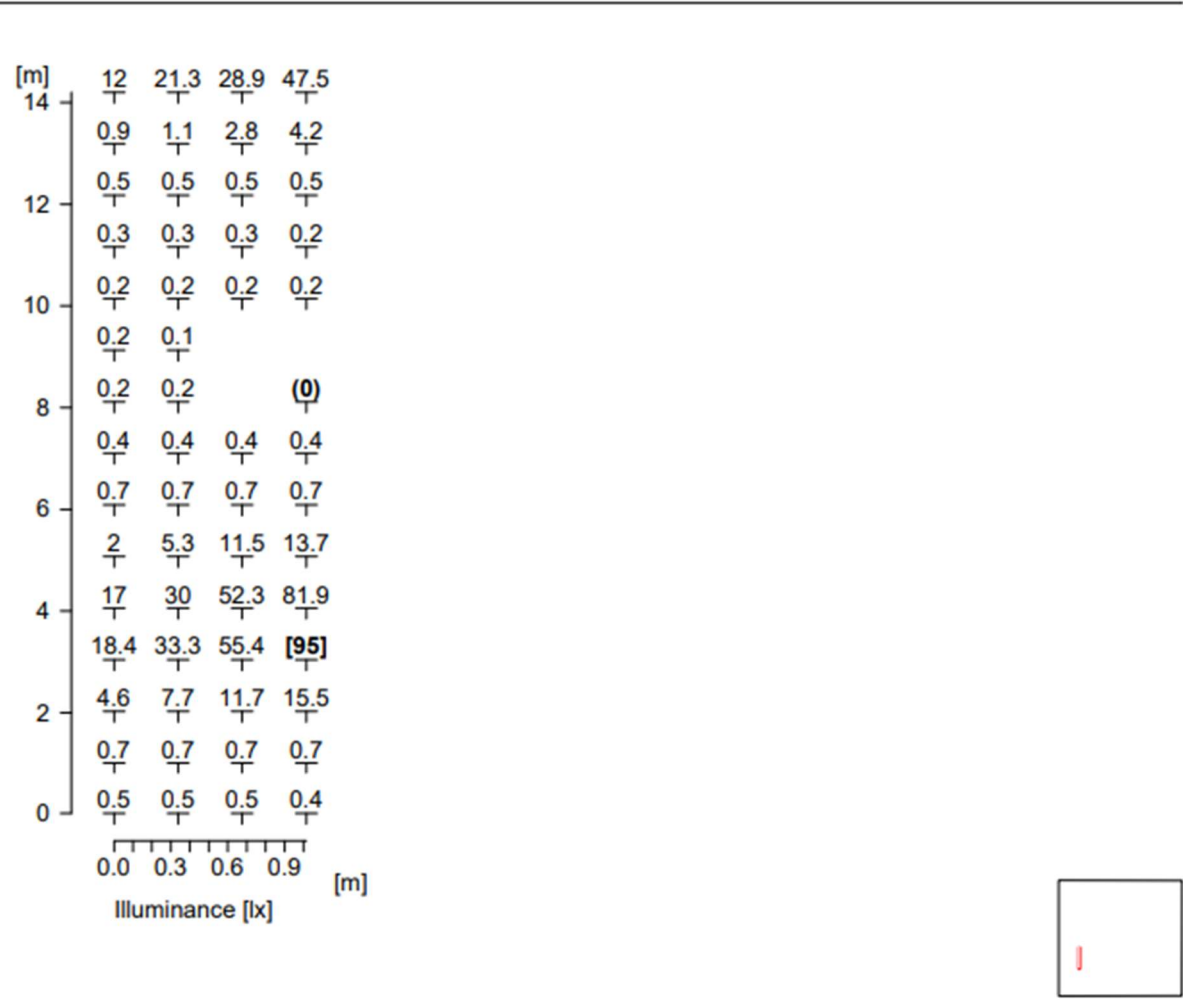
2.2.13 Table, Walkway Ground level 0m. LHS1 (E)



Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 14 lx
Minimum illuminance	Emin	: 0 lx
Maximum illuminance	Emax	: 153 lx
Uniformity Uo	Emin/Eav	: 1 : 47.35 (0.02)
Diversity Ud	Emin/Emax	: 1 : 502.95 (0.00)

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – Walkway 3 (LHS 2) Lighting Level

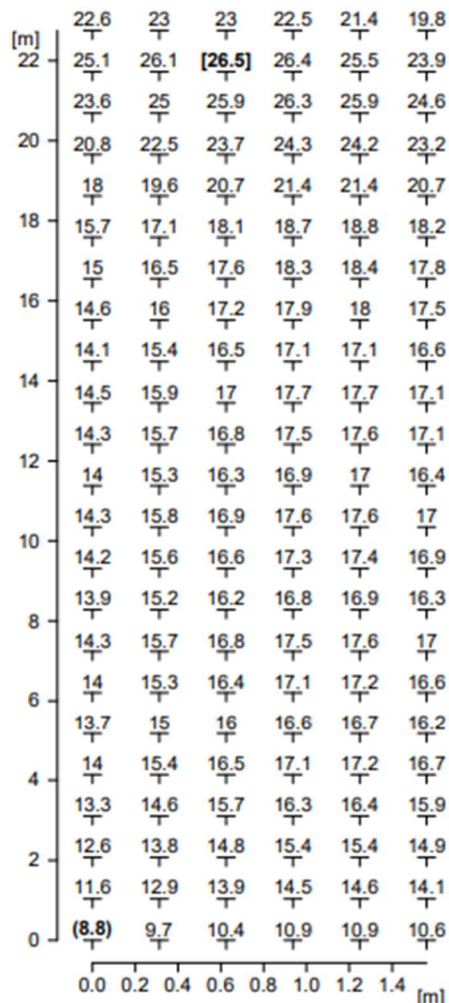
2.2.14 Table, Walkway Ground level 0m.LHS 2 (E)



Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 10.3 lx
Minimum illuminance	Emin	: 0 lx
Maximum illuminance	Emax	: 95 lx
Uniformity Uo	Emin/Eav	: ---
Diversity Ud	Emin/Emax	: ---

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – Walkway 4 1st Floor (RHS) Lighting Level

2.2.8 Table, Walkway High level 4m. (E)

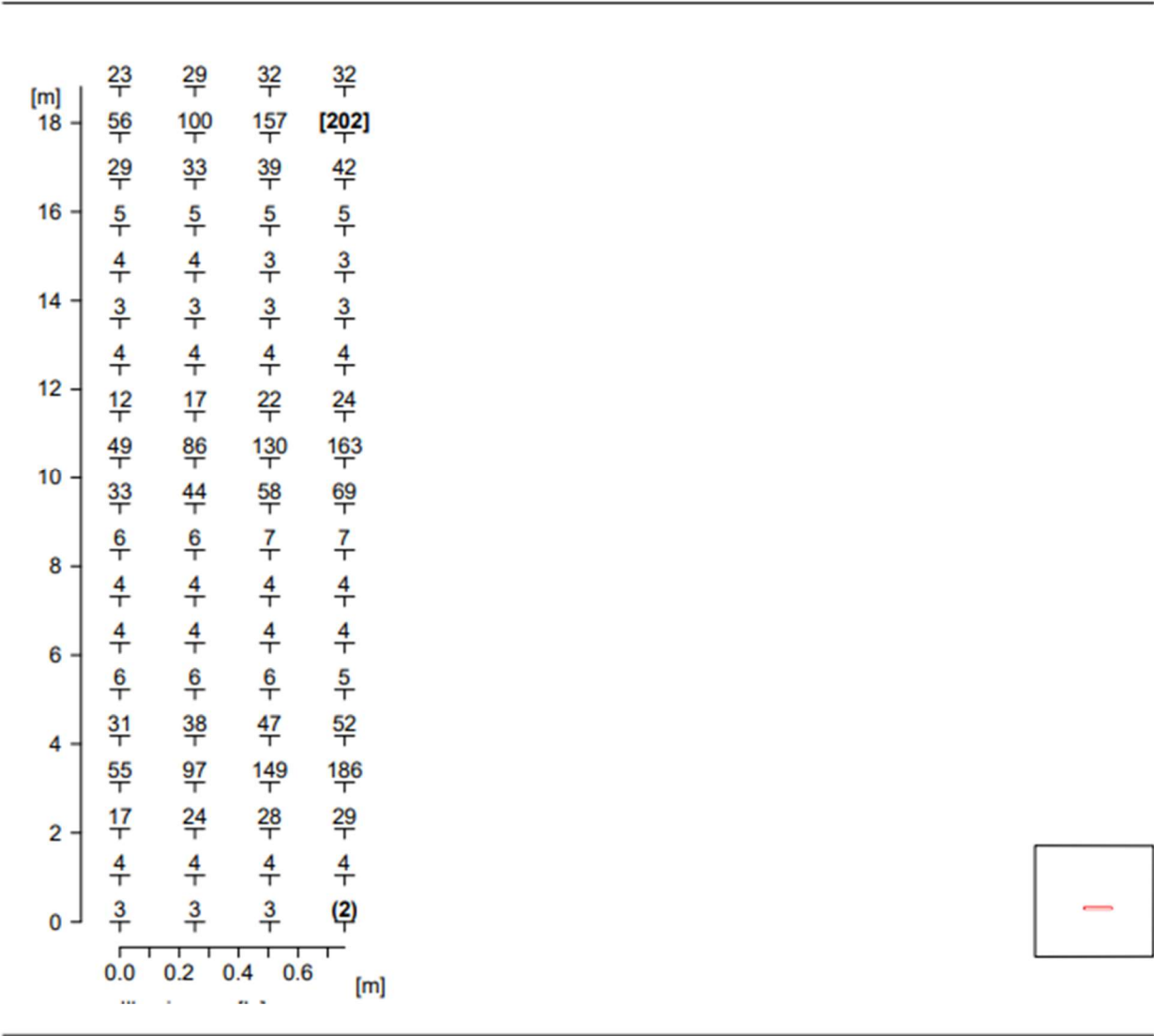


Height of the reference plane

Average illuminance	Eav	: 4.05 m
Minimum illuminance	Emin	: 17.4 lx
Maximum illuminance	Emax	: 8.8 lx
Uniformity Uo	Emin/Eav	: 26.5 lx
Diversity Ud	Emin/Eav	: 1 : 1.97 (0.51)
	Emax/Emin	: 1 : 3.01 (0.33)

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – Walkway 5 (Square top) Lighting Level

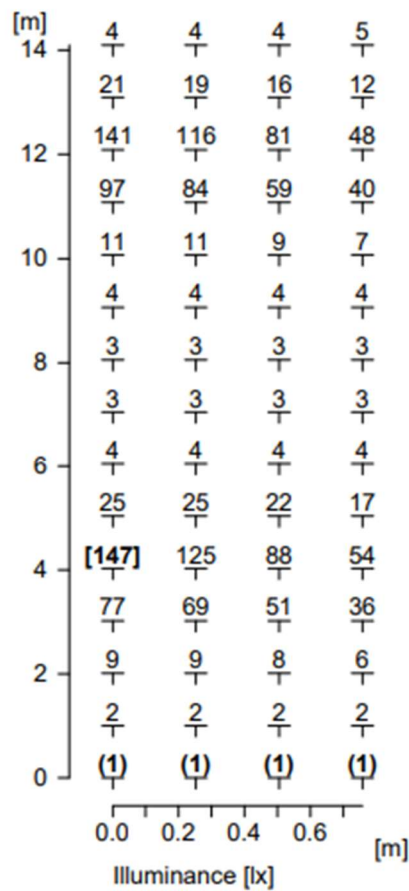
2.2.12 Table, Walkway Ground level 0m.(Square Top) (E)



Height of the reference plane		: 0.00 m
Average illuminance	Eav	: 32 lx
Minimum illuminance	Emin	: 2 lx
Maximum illuminance	Emax	: 202 lx
Uniformity Uo	Emin/Eav	: 1 : 12.78 (0.08)
Diversity Ud	Emin/Emax	: 1 : 81.53 (0.01)

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew)
 Calculation Results – Walkway 6 (Square LHS) Lighting Level

2.2.11 Table, WalkwayGround level 0m.(Square LHS) (E)



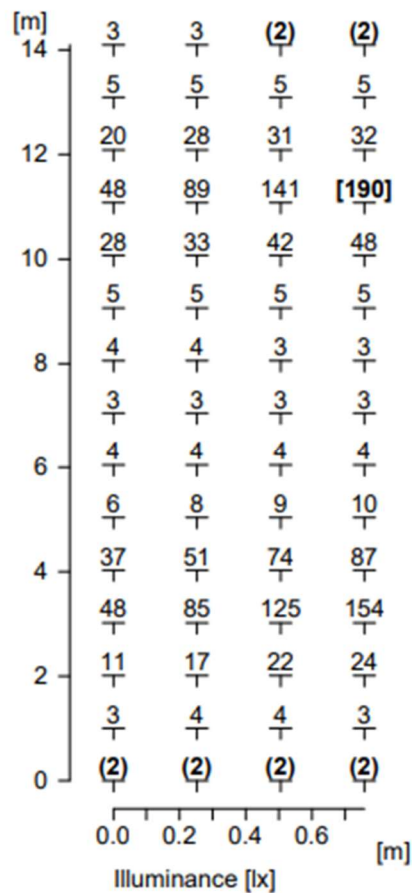
Height of the reference plane

Average illuminance
 Minimum illuminance
 Maximum illuminance
 Uniformity Uo
 Diversity Ud

: 0.00 m
 Eav : 27 lx
 Emin : 1 lx
 Emax : 147 lx
 Emin/Eav : 1 : 20.52 (0.05)
 Emin/Emax : 1 : 111.29 (0.01)

Hexham Road – Exterior Lighting 6b Security Lighting Output (Post- Curfew) Calculation Results – Walkway 7 (Square RHS) Lighting Level (Lux)

2.2.10 Table, Walkway Ground level 0m.(Square RHS) (E)

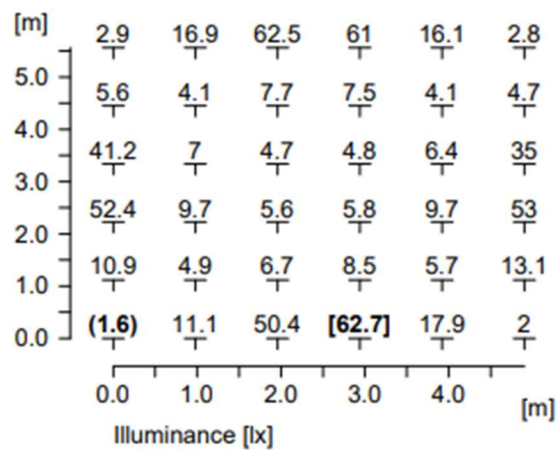


Height of the reference plane

Average illuminance	Eav	: 0.00 m
Minimum illuminance	Emin	: 2 lx
Maximum illuminance	Emax	: 190 lx
Uniformity Uo	Emin/Eav	: 1 : 13.74 (0.07)
Diversity Ud	Emin/Emax	: 1 : 97.11 (0.01)

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – Walkway 8 (Open Square) Lighting Level

2.2.16 Table, Open Square Ground level (E)

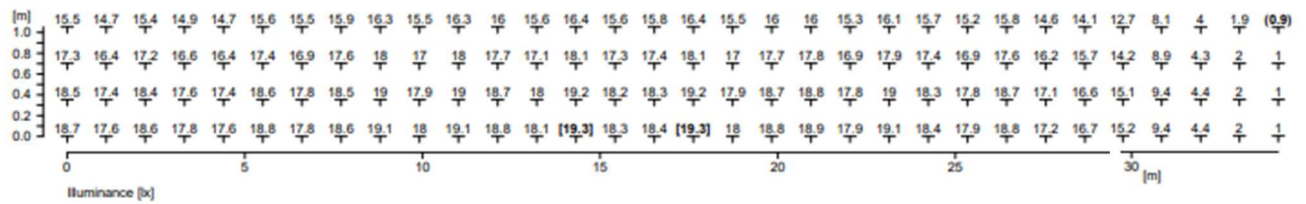


Height of the reference plane

Average illuminance	Eav	: 0.00 m
Minimum illuminance	Emin	: 17.4 lx
Maximum illuminance	Emax	: 1.6 lx
Uniformity Uo	Emin/Eav	: 62.7 lx
Diversity Ud	Emin/Emax	: 1 : 10.89 (0.09)
		: 1 : 39.24 (0.03)

Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew) Calculation Results – Walkway 9 (2nd Floor) Lighting Level

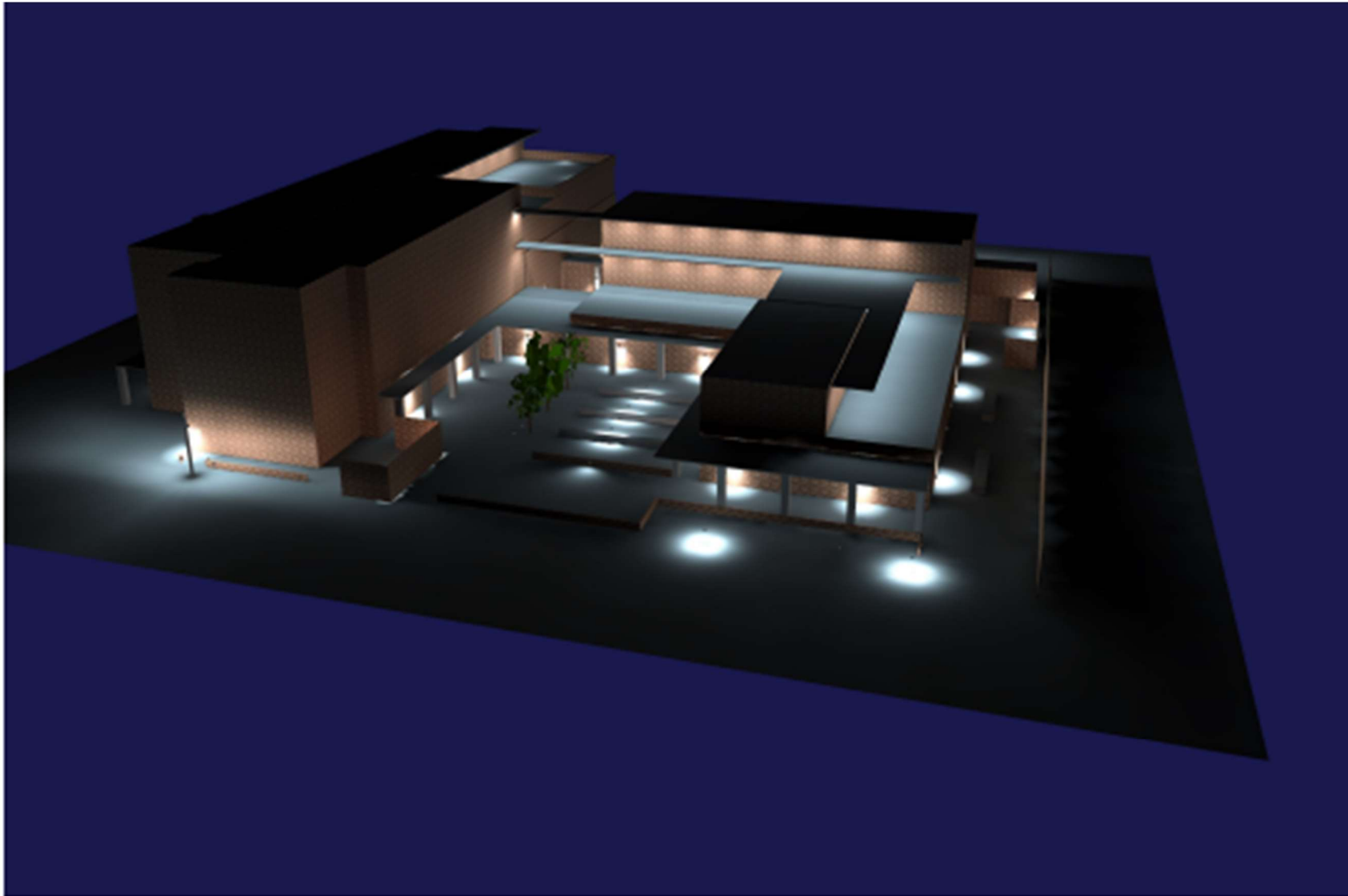
2.2.9 Table, Walkway High Level 7m. (E)



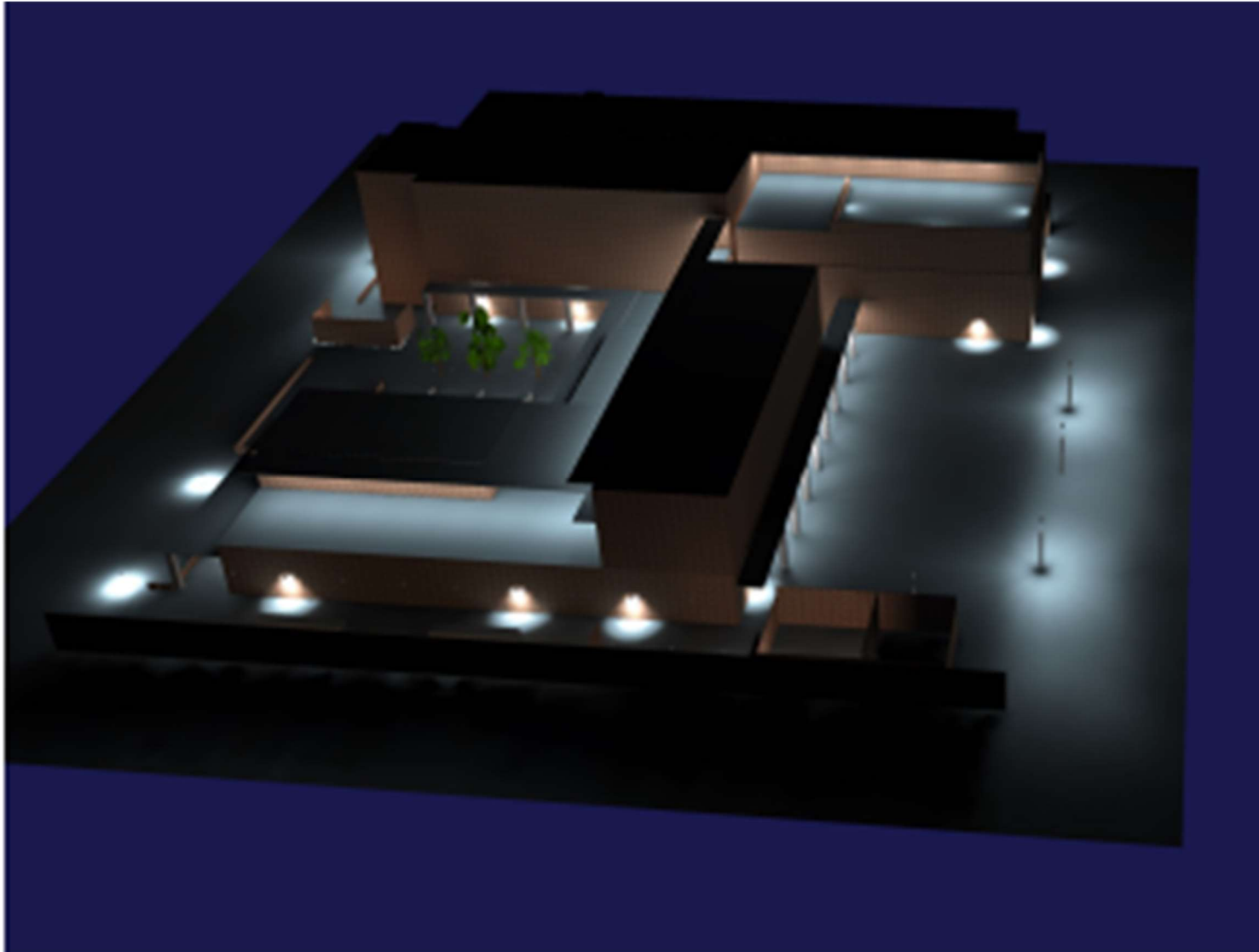
Part1

Height of the reference plane		: 7.15 m
Average illuminance	Eav	: 15.6 lx
Minimum illuminance	Emin	: 0.9 lx
Maximum illuminance	Emax	: 19.3 lx
Uniformity Uo	Emin/Eav	: 1 : 17.01 (0.06)
Diversity Ud	Emin/Emax	: 1 : 21.02 (0.05)

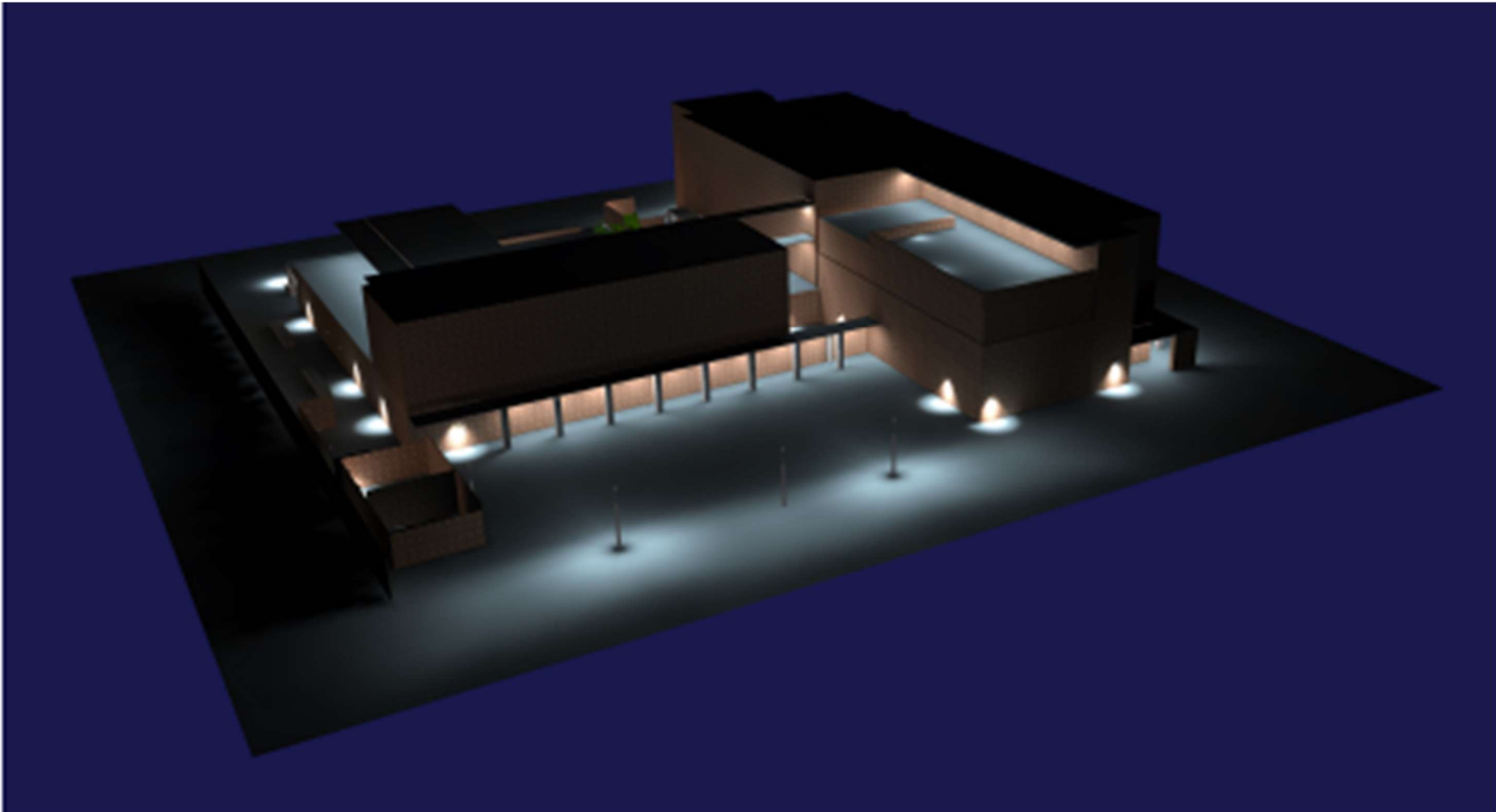
EXTERIOR LIGHTING 6b SECURITY LIGHTING (POST-CURFEW) – 3D VIEWS



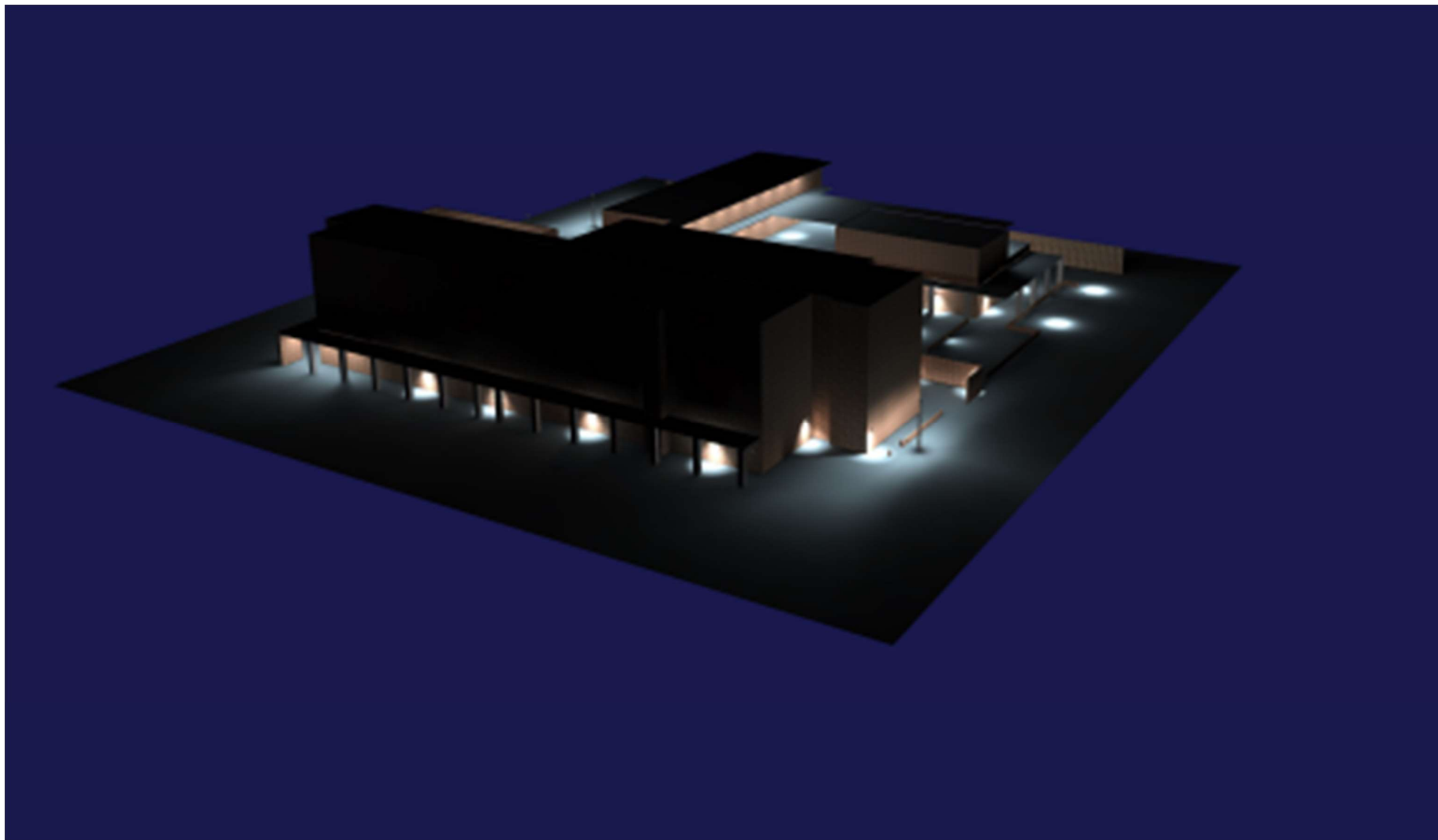
Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew)
Calculation Results – 3D Illuminance View - Looking North (Bede Walk & Neighbouring property)



Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew)
Calculation Results – 3D Illuminance View - Looking West (Neighbouring property & Carpark)



Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew)
Calculation Results – 3D Illuminance View - Looking West (Carpark & Pedestrian Entrance)



Hexham Road – Exterior Lighting 6b Security Lighting (Post- Curfew)
Calculation Results – 3D Illuminance View - Looking North - East (Northumberland Ave. & Bede Walk)

8 Proposed External Luminaire Types

- EL- 1 Alumet IP66 20W LED Light Column
- EL- 2 Extruded Enclosure with IP65 10W LED tape Linear Soffit Light
- EL-2E As above but complete with Remote Emergency Battery Pack
- EL- 3 Enola IP65 Wall Mounted 11W LED Cylinder Down Light
- EL- 3E As above but complete with Remote Emergency Battery Pack
- EL- 4 17W IP66 LED Bollard Light
- EL- 5 9.5W IP65 LED Brick Light
- EL- 6 Enola IP65 Wall Mounted 20W LED Cylinder Up & Down Light
- EL- 6E As above but complete with Remote Emergency Battery Pack
- EL- 7 Symmetrical in Ground 29W IP67 LED Up Light
- EXL-Existing Lamp Posts

Proposed Specified External luminaires.

Symbol	Quantity	Article number	Article name	Equipment
	17	CLS -1003423	Type EL3-ENOLA Wall mounted down light	1xLED 11 W
	7	CLS-B500F1X17U4K	Type EL4 - Bollard 17W LED	1xDNE 17W LED ARRAY 18.1 W
	112	FLSS-SN IP65 3000K	Type EL2 -Extruded enclosure with 10W LED tape IP65 3000K	1xLED 10 W
	23	CLS -1003423 - EMG	Type EL3E - ENOLA Wall mounted down light - Emergency	1xLED 11 W
	41	FLSS-SN IP65 3000K-EMG	Type EL2E - Extruded enclosure with 10W LED tape IP65 3000K - Emergency	1xLED 10 W
	16	233650	Emergency	1xLED 0 11 W
	6	CLS -1002897	DASARA Symmetrical In-ground 29W LED Uplight	1xLED 0 29 W
	8	CLS - 1003425	ENOLA Wall mounted 19W LED Up - Down luminaire	1xLED 0 19 W
	9	CLS - 1003425 - EMG	ENOLA Wall mounted 19W LED Up - Down luminaire - Emergency	1xLED 0 19 W
	4	CLS -1003423 - EMG	Type EL3E - ENOLA 11W LED Wall mounted down light - Emergency	1xLED 11 W
	2	CLS -1003423	Type EL3 ENOLA 11W LED Wall mounted down light	1xLED 11 W
	17	FLSS-SN IP65 3000K-EMG	Type EL2E - Extruded enclosure with 10W LED tape IP65 3000K - Emergency	1xLED 10 W
	5	96274743	ALULUM 24L25-730 WSC-A CL LRT CL2 G4M	1xALUL_24L25WSC3KCL 20 W

9. Glare

The measures taken to avoid glare area as follows:

- All luminaires to be LED type provided with DALI control gear.
- Luminaires to be specified to be as 3000°K colour temperature (this helps reduce the blue component at the shorter wavelength part of the spectrum). A lower correlated colour temperature (CCT) generally, but not always corresponds to a relatively low proportion of blue wavelengths in the visible spectrum, as CCT increases the appearance becomes a cooler blueish- white colour.
- By reducing the amount of blue light emitted together with controlling the timing and duration of the artificial luminaire use this blue light peaks in the visible spectrum. (Exposure at night may disrupt their circadian rhythm and may disrupt melatonin production. As some animals perceive wavelengths of light at in different areas of the electromagnetic spectrum, some at much lower light intensities than humans can see, this can enhance or distract from an animal's vision changing behaviour such as foraging, navigation and reproductive behaviour. At an ecosystems level light can also change how species interact.)
- As LED's to be provided will have precise optical control, which will aid the luminaires spectral distribution and will aid animals who also possess a circadian clock that regulates aspects of their activity and physiology on a cycle that usually approximates 24 hours. We have restricted the upward light component for almost all luminaires on the installation to avoid confusing patterns of light.

10 Conclusions

It can be seen from the summary sheet located within the Appendix that the sky glow calculation for the proposed luminaires for the external lighting scheme passes as it falls below that of the maximum of 5% threshold for an E3 external lighting scheme based on the current requirements of BS 12464-2.

It can be seen from the summary sheet located within the Appendix that the Light trespass calculations that all proposed external lighting luminaires all pass and therefore comply for the North, south and west elevations. However, on the east elevation the 2% post curfew limit appears to be exceeded. It will therefore be necessary to ensure that all luminaires are DALI controlled which will enable all proposed external lighting is amended to security level. This will mean some luminaires are switched off using the DALI lighting control post curfew to ensure post curfew lighting limits are compliant. Lighting levels will be reduced to security level but still remain safe for resident access, egress and safe movement along the walkways.

It can be seen from the summary sheet located within the Appendix that the source intensity for all proposed external luminaires is complaint.

By adopting the lighting strategy including criteria, luminaries, lighting control and switching methods etc. outlined in this report it can be concluded that:

- Lighting levels at the site boundary will be as regulated by the current standards.
- The proposed luminaires and the provided lighting levels should not cause excessive glare to neighbouring properties.
- The majority of the luminaries will not be directly visible to neighbouring properties.
- The effect on the night sky and ecology should be minimal inside the site and zero outside the site.
- The lighting scheme will be energy efficient utilizing luminaires with high efficiency LED light sources, combined with efficient lighting controls.
- An adequate and safe level of lighting can be provided for site tasks, amenity and security, whilst maintaining a minimal impact on the site surroundings, environment and neighbouring properties.

I trust that the attached report concludes that there is limited and controlled light pollution from artificial light sources on nature conservation in accordance with para 180 of the NPPF and therefore unlikely to significantly and adversely affect the wildlife or disrupt the life cycle and behaviour of the invertebrates, bats and other wildlife across the site, but particularly where the existing and new trees and the proposed swift and bat boxes will be located.

It should be noted that it is difficult to achieve the balance between providing an effective exterior lighting scheme and avoid the problems relating to ecology, However I believe we have achieved this. We trust that we have provided sufficient information to allow you to proceed with this project.

Appendix A – Manufacturers Info.

6.1 Manufacturers Data Sheets

- EL- 1 20W LED Light Column (Alumet Direct Control)

Alumet Control Direct

96274743 ALUMET CD 24L25-730 WSC-A CL LRT CL2 G4

THORN

LED 20W ALUM_24L25WSC3KCL	ISO 9223	C3	IP66	IK10		CE						Ta25
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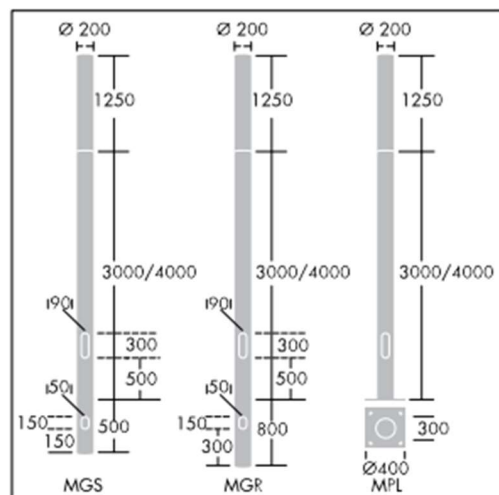
Alumet Control Direct

An architectural lighting column head with 24 LEDs driven at 250mA with a Wide Street & Comfort, asymmetric distribution and clear optic, configured for power reduction, controlled by an additional switched phase cable. ON = 100%, OFF = 50%, Top cap: die-cast aluminium. Diffuser: clear UV stabilised polycarbonate treated with anti graffiti varnish. Top cap and column: powder coated textured silver grey (close to RAL 9006), other RAL colours on request. Class II electrical, IK10, IP66. To be mounted on an Alumet column. Surge protection: 10kV single pulse common mode and 8kV multipulse common mode and 6kV multipulse differential mode. If permanent DALI system is connected, 6kV multipulse common and differential mode. Complete with 3000K LED

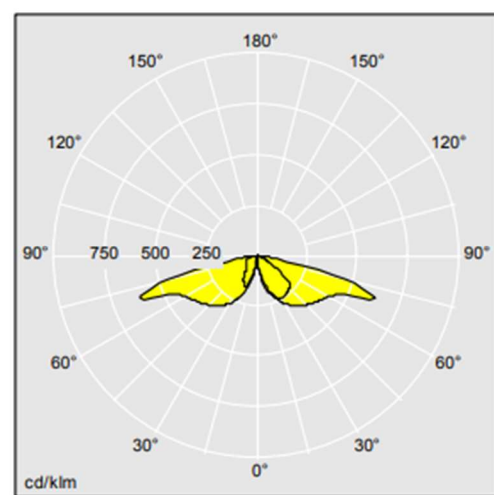
Dimensions: Ø200 x 1250 mm
Luminaire input power: 20 W
Luminaire luminous flux: 2069 lm
Luminaire efficacy: 103 lm/W
Weight: 9.8 kg
Scx: 0.079 m²



TLG_ALUM_F_DIR_LED24_LGY.jpg



TLG_ALUM_M_2LD1.wmf



TLLA_ALCD24L25WSC3KG33_DC.ltd

Lamp position: STD - standard
Light Source: LED
Luminaire luminous flux*: 2069 lm
Luminaire efficacy*: 103 lm/W
Colour Rendering Index min.: 70
Ballast: 1 x 96271178 DRV OS OT 60W 1.05A 115V
D #1A0 4DIMLT2

Correlated colour temperature: 3000 Kelvin
Chromaticity tolerance (initial MacAdam): 5
Rated useful life (B10)*:
L80 100000h at 25°C
Luminaire input power*: 20 W Power factor = 0.95
Dimming: SETLRT dimmable to 10%
LOR: 1,00 ULOR: 0,00 DLOR: 1,00

- EL- 2 Recessed Linear Soffit Light (Enclosure)

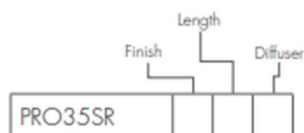
Recessed PRO Black - 50 x 35
PRO35SR - XXX



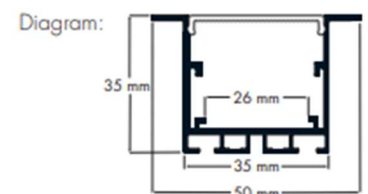
PRO



Product Reference:



PRO35SR	Finish	Length	Diffuser	Accessories
	1 Black	1m 1 meter 2m 2 meter	O Opal C Clear	PRO-90D Corner Coupler PRO-180D Straight Coupler

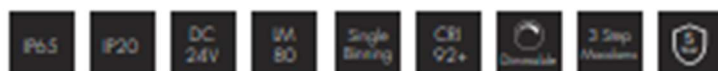


* Each meter of Foss Profile comes with 2 Clips + End Caps as standard; for extra packs please quote code PRO35SR-1AC

- EL- 2 Recessed Linear Soffit Light (LED Tape located within above enclosure)

Single Colour - 10W Per Metre
FLS3 - XXXXX

ECO



Our ECO SERIES 10W per metre LED Strip features branded high efficiency 2835 SMD LEDs on a 2oz PCB board for a durable finish.

Easy mounting thanks to added strength (3M 300LSE) self adhesive and backed up by a 3 year standard and 5 year Extended Manufacturer's Warranty.

Product Reference:



FLS3	Finish	Kelvin	Beam Angle	Light Source - Per Metre	Pack
	0 IP20	G 2700K	1 120°	S3 780 - 900 lm/10w Blue 16Sim / MCD Conversion	1 5 metre Reel
	5 IP65	C 3000K			2 10 metre Reel
		N 4000K			
		D 6500K			
		B Blue			



1.3 Complete Lighting Services Limited, Type EL2 -Extruded enc... (IFLS5-5N IP65 3...)

1.3.1 Data sheet

Manufacturer: Complete Lighting Services Limited

IFLS5-5N IP65 3000K

Type EL2 -Extruded enclosure with 10W LED tape IP65 3000K

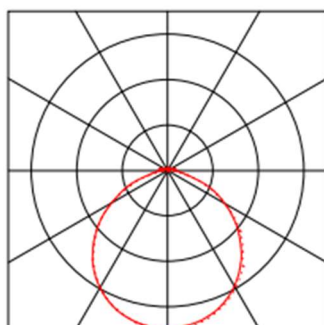
Luminaire data

Absolute Photometry
Luminaire efficacy : 82 lm/W
Classification : A41 ↓96.6% ↑3.4%
CIE Flux Codes : 49 81 96 97 100
UGR 4H 8H : 31.0 / 30.2
Power : 10 W
Luminous flux : 820 lm

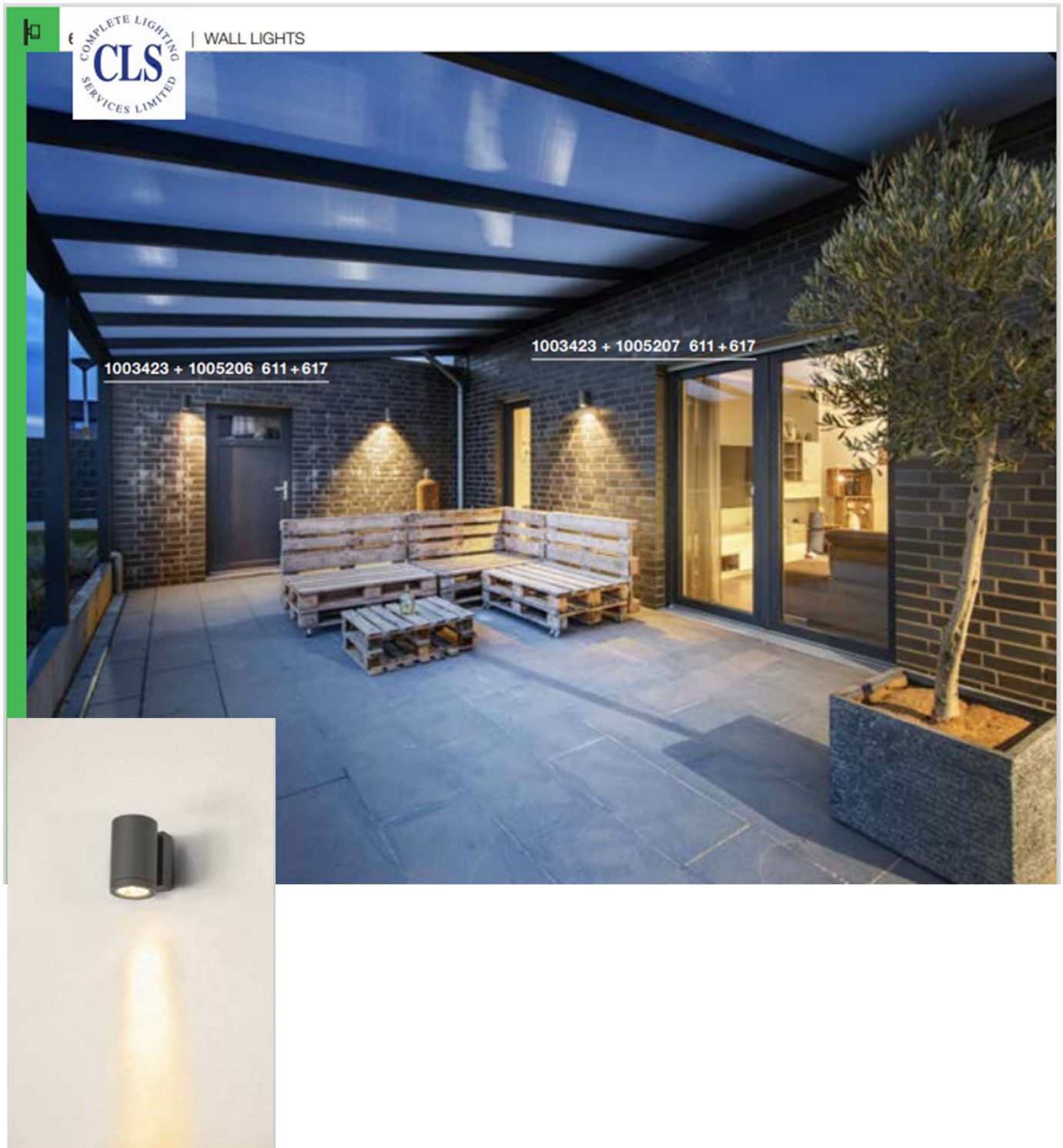
Equipped with

Quantity : 1
Designation : LED
Colour : 4000K
Colour reproduction : 92

Dimensions : 1000 mm x 10 mm x 4 mm



- EL- 3 Wall Mounted Cylinder Down Light



- EL- 3 Wall Mounted Cylinder Down Light

OUTDOOR | WALL LIGHTS 611

ENOLA ROUND S
WL, single

LED




450lm / 500lm
3000K / 4000K
CRI 90



100-240V ~50/60Hz | 500mA
Total wattage: 6W
Material: aluminium/glass

ENOLA ROUND M
WL, single

LED




800lm / 980lm
3000K / 4000K
CRI 90



220-240V ~50/60Hz | 500mA
Total wattage: 11W
Material: aluminium/glass

ENOLA ROUND L
WL, single

LED




2000lm / 3700lm
3000K / 4000K
CRI 90



220-240V ~50/60Hz | 900mA
Total wattage: 36W
Material: aluminium/glass

Complete Lighting Services Limited
Bookdown House, Southern Road, Basingstoke, Hants, RG21 3DZ
Tel: 01256 811980 Fax: 01256 811981 email: woylton@completelighting.co.uk



1003422 450/500lm 3000/4000K A→G E

Options: 1003853
Reflector, 60°
1005262

1003423 800/980lm 3000/4000K A→G E

Options: 1003853
Lens, 12°
1005205
Asymmetrical lens
1005206
Reflector, 60°
1005207

1003440 2000/3700lm 3000/4000K A→G E

Options: 1003853
Reflector, 60°
1005262

Options Prod. no.
450/500lm | 3000/4000K | CRI90
anthracite 1003422

Options Prod. no.
800/980lm | 3000/4000K | CRI90
anthracite 1003423

Options Prod. no.
2000/3700lm | 3000/4000K | CRI90
anthracite 1003440

1 Luminaire data



1.1 Complete Lighting Services Limited, Type EL3-ENOLA Wall mounte... (ICLS -1003423)

1.1.1 Data sheet

Manufacturer: Complete Lighting Services Limited

ICLS -1003423 Type EL3-ENOLA Wall mounted down light

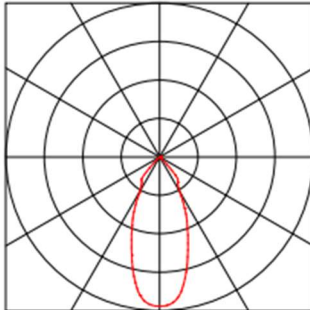
Luminaire data

Luminaire efficiency : 103.667%
Luminaire efficacy : 92.55 lm/W
Classification : A70 ↓100.0% ↑0.0%
CIE Flux Codes : 94 99 100 100 104
UGR 4H 8H : <10.0 / <10.0
Power : 11 W
Luminous flux : 1018 lm

Equipped with

Quantity : 1
Designation : LED
Power : 11 W
Colour :
Luminous flux : 982 lm

Dimensions : Ø150 mm x 160 mm



- EL-4 -17W LED Bollard Light

EasyLED Technology

The CLS UK EasyLED Full Cutoff Bollards with choice of optics are designed to replace HID lighting systems up to 70w MH or HPS. These fixtures are ideal for retail centres, industrial parks, schools and universities, public transit and airports, office buildings and medical facilities.

Specifications and Features:

Housing:

Extruded aluminium housing with flush mounting base, flat top.

Listing & Ratings:

CE: Listed for wet locations, ANSI/UL 1598, 8750
IP66 sealed LED compartment.

Finish:

Textured architectural black (close to RAL 9005) powdercoat finish over a chromate conversion coating. Custom colours available upon request.

Styles:

360° light distribution or 180° shield

Lens:

Clear UV-stabilised polycarbonate vandal-resistant lens

Mounting Options:

Mounting kit with 200mm Zinc-Plated Anchor Bolts, included.

EasyLED LED:

Aluminium boards

Wattage:

360° 17w array model: 18.9w
180° 16w array model: 18.5w
(70w HID equivalent)

Driver:

CE Certified Driver

Warranty:

5-year Warranty for -40°C to +50°C environment.

See page 2 for Projected Lumen Maintenance Table.



EasyLED Full Cutoff Bollard

L70
25°C

147,000 Hours



BSE0QF
Full Cutoff Bollard
with 360° Distribution



BSEHQF
Full Cutoff Bollard
with 180° Shield



Shown with "S3"
Sensor

Dimensions

Diameter (D)	120mm
Height (A)	1019mm



Order Information Example:

BSE0QF1X17U4KCB

	U		C		
Model	Driver	CCT	Lens	Colour	Options
BSE0QF1X17=Full Cutoff Bollard - 360° BSEHQF1X16=Full Cutoff Bollard with 180° Shield	U=CE Certified Driver	3K=3000K 4K=4000K	C=Clear UV-Stabilised Polycarbonate Vandal-Resistant Lens	B=Black C=Custom (Consult Factory)	S3=Microwave Sensor with Dimming & Remote Programming, 120-277V Only. See P17121 Spec Page for Details.

Certification & Listings:



1.2 Complete Lighting Services Limited, Type EL4 - Bollard 17W... (ICLS-B5OQF1X17U4K)

1.2.1 Data sheet

Manufacturer: Complete Lighting Services Limited

ICLS-B5OQF1X17U4K Type EL4 - Bollard 17W LED

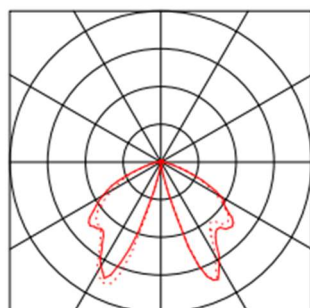
Luminaire data

Absolute Photometry
Luminaire efficacy : 38.8 lm/W
Classification : A40 ↓98.1% ↑1.9%
CIE Flux Codes : 42 82 97 98 96
UGR 4H 8H : 21.4 / 21.2
Power : 18.1 W
Luminous flux : 702.2 lm

Dimensions : Ø120 mm x 100 mm

Equipped with

Quantity : 1
Designation : ONE 17W LED
ARRAY
Colour : 3000K
Colour reproduction : 0



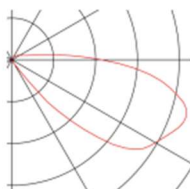
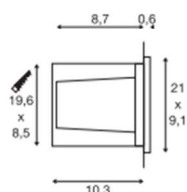
- EL-5 9.5W IP65 LED Brick Light



BRICK

outdoor recessed wall light, LED, 3000K, stainless steel, 230V, IP67, 850lm, 10W

With the BRICK LED recessed wall light, which is made of stainless steel and aluminium, the built-in LEDs are covered by a glass sheet. The built-in reflector means that the light is output asymmetrically. The functional luminaire is connected directly to the 230V mains supply. With IP65 protection class, the luminaire is suitable for outdoor use. A mounting pot is included in the delivery for simple assembly. This luminaire contains built-in LED lamps.



TECHNICAL DATA

Item no.	233660
Number of different light outlets	1
IP Code	IP 65
Impact resistance class	IK 02
Impact resistance	0.2 Joule
Assembly	Recessed
Assembly details	Wall
Primary nominal voltage	220-240V ~50/60Hz
Secondary power / voltage	144 mA
Safety class	I
Wattage	9.5 W
Minimum ambient temperature	-20 °C
Maximum ambient temperature	45 °C
Stroboscopic effect (SVM)	0.02
Lumen	850 lm
Colour temperature	3000 Kelvin
Color	stainless steel
CRI	80
LXXBXX data	L70B50
Service life	25000 h
Length	21 cm
Width	9.1 cm

Complete Lighting Services Limited

Rookdown House, Southern Road, Basingstoke, Hants, RG21 3DZ

Tele: 01256 811600 Fax: 01256 811601 email: reception@completelighting.co.uk



Light Source

916633	
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Depth	9.3 cm
Net weight	1.756 kg
Gross weight	1.844 kg
Shape of cut-out	square
Installation length	19.6 cm
Installation width	8.5 cm
Installation depth	10.3 cm
BIG WHITE Page	702

- EL-6 20W LED Up/Downlight

ENOLA ROUND S UP/DOWN WL



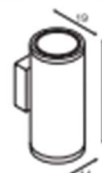
220-240V - 50/60Hz | 350mA
Total wattage: 7.8W
Material: aluminium/glass

ENOLA ROUND M UP/DOWN WL



220-240V - 50/60Hz | 500mA
Total wattage: 20W
Material: aluminium/glass

ENOLA ROUND L UP/DOWN WL



220-240V - 50/60Hz | 700mA
Total wattage: 55W
Material: aluminium/glass

Up/Down	310/350lm 3000/4000K	A++ G E
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Options	Prod. no.
Spacers	Prod. no. 1002853
Reflector, 60°	Prod. no. 1005262

Options	Prod. no.
Up: 310/350lm 3000/4000K CRI90	
Down: 310/350lm 3000/4000K CRI90	
anthracite	1003424

Up/Down	830/950lm 3000/4000K	A++ G E
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Options	Prod. no.
Spacers	Prod. no. 1002853
Lens, 19°	Prod. no. 1005205
Asymmetrical lens	Prod. no. 1005206
Reflector, 60°	Prod. no. 1005207

Options	Prod. no.
Up: 830/950lm 3000/4000K CRI90	
Down: 830/950lm 3000/4000K CRI90	
anthracite	1003425

Up/Down	2700/3000lm 3000/4000K	A++ G E
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Options	Prod. no.
Spacers	Prod. no. 1002853
Reflector, 60°	Prod. no. 1005263

Options	Prod. no.
Up: 2700/3000lm 3000/4000K CRI90	
Down: 2700/3000lm 3000/4000K CRI90	
anthracite	1003441

1.7 Complete Lighting Services Limited, ENOLA Wall mounted 19W LED... (ICLS - 1003425)

1.7.1 Data sheet

Manufacturer: Complete Lighting Services Limited

ICLS - 1003425 ENOLA Wall mounted 19W LED Up _ Down luminaire

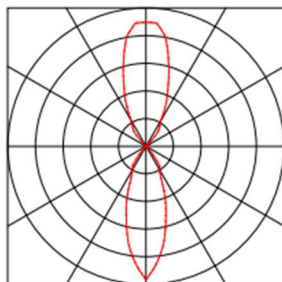
Luminaire data

Luminaire efficiency : 100%
Luminaire efficacy : 100.63 lm/W
Classification : C74 ↓45.8% ↑54.2%
CIE Flux Codes : 97 100 100 46 102
UGR 4H 8H : <10.0 / <10.0
Power : 19 W
Luminous flux : 1912 lm

Equipped with

Quantity : 1
Designation : LED 0
Colour : 3000K
Luminous flux : 1912 lm

Dimensions : Ø150 mm x 230 mm



1.8 Complete Lighting Services Limited, ENOLA Wall mounted 19W... (ICLS - 1003425 ...)

1.8.1 Data sheet

Manufacturer: Complete Lighting Services Limited

ICLS - 1003425 - EMG ENOLA Wall mounted 19W LED Up _ Down luminaire - Emergency

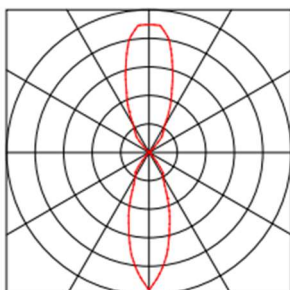
Luminaire data

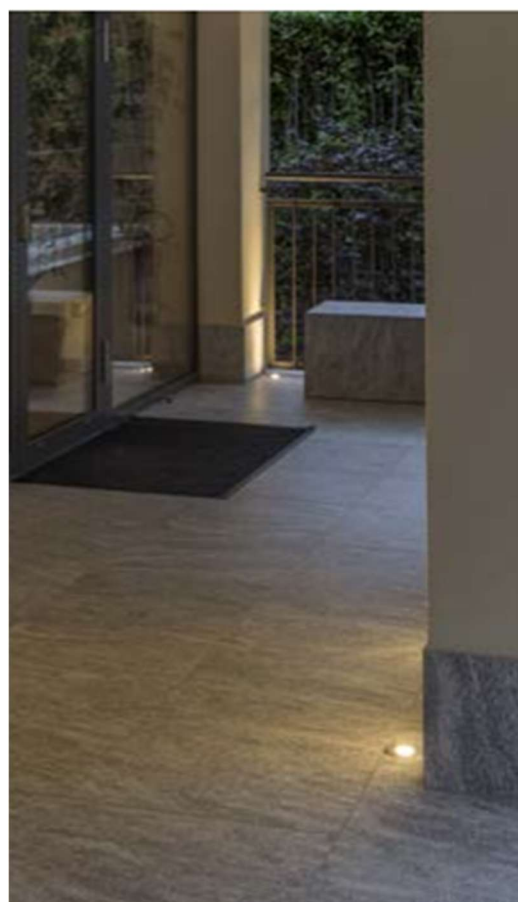
Luminaire efficiency : 100%
Luminaire efficacy : 100.63 lm/W
Classification : C74 ↓45.8% ↑54.2%
CIE Flux Codes : 97 100 100 46 102
UGR 4H 8H : <10.0 / <10.0
Power : 19 W
Luminous flux : 1912 lm

Equipped with

Quantity : 1
Designation : LED 0
Colour : 3000K
Luminous flux : 1912 lm

Dimensions : Ø150 mm x 230 mm

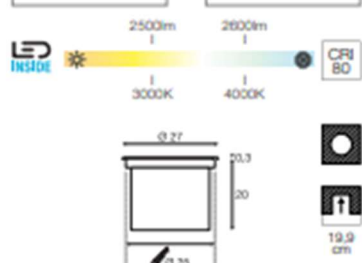
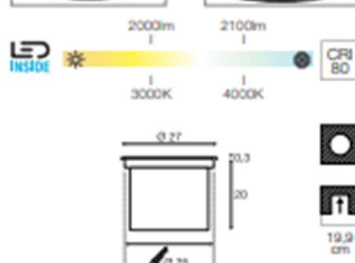
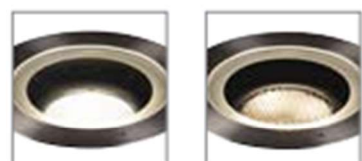




1002893 719

DASAR® 270
EL, asymmetrical

DASAR® 270
EL, symmetrical



220-240V ~50/60Hz | 700mA
Total wattage: 30W
Material: aluminium/316 stainless steel

220-240V ~50/60Hz | 700mA
Total wattage: 30W
Material: aluminium/316 stainless steel

Options	Prod. no.
2000lm 3000K CR180	
stainless steel	1002893
2100lm 4000K CR180	
stainless steel	1002895

Options	Prod. no.
2500lm 3000K CR180	
stainless steel	1002897
2600lm 4000K CR180	
stainless steel	1002898

DASAR® 270
Honeycomb cover
Prod. no. 1002899

Options	Prod. no.
2000lm 3000K CR180	
stainless steel	1002893
2100lm 4000K CR180	
stainless steel	1002895

Options	Prod. no.
2500lm 3000K CR180	
stainless steel	1002897
2600lm 4000K CR180	
stainless steel	1002898

1.6 Complete Lighting Services Limited, DASARÂ Symmtrical In-ground... (CLS -1002897

1.6.1 Data sheet

Manufacturer: Complete Lighting Services Limited

CLS -1002897 DASARÂ Symmtrical In-ground 29W LED Uplight

Luminaire data

Luminaire efficiency : 100%
Luminaire efficacy : 87.83 lm/W
Classification : E04 ↓0.0% ↑100.0%
CIE Flux Codes : --- 0 100
UGR 4H 8H : - / -
Power : 29 W
Luminous flux : 2547 lm

Equipped with

Quantity : 1
Designation : LED 0
Colour : 3000K
Luminous flux : 2547 lm
Colour reproduction : 0

Dimensions : Ø270 mm x 3 mm

