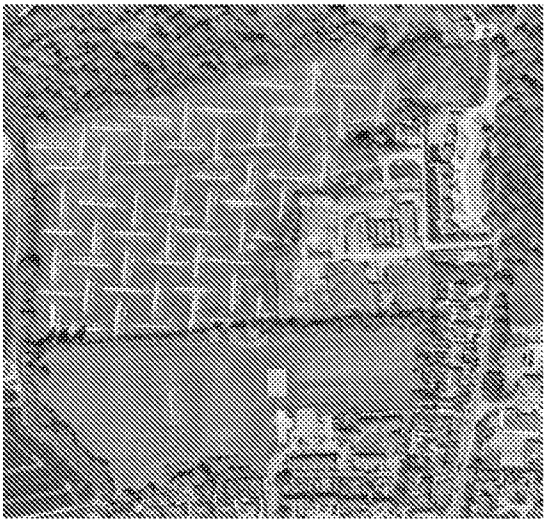
Building Services
Consulting Engineers

EXTERNAL LIGHTING STRATEGY REPORT

AT



PALMER ROAD SPORTS HUB
DECOY DRIVE
ANGMERING
LITTLEHAMPTON
BN16 4DN

FOR

ARUN DISTRICT COUNCIL

NOVEMBER 2024

DOCUMENT REVISION RECORD

Original Document

Compiled by	Stuart McFarlane	Date	November 2024
Checked by:	Peter Sheppard	Date:	November 2024

Issue Record

Reason for Issue	Revision	Date	Chkd
Planning Submission	P1	05.11.2024	PS
Planning Submission	P2	20.11.2024	MF

Contents

1 EXECUTIVE SUMMARY

This Lighting Strategy document discusses the type and level of lighting requirements of the proposed Palmer Road Sport Hub and Angmering, Littlehampton BN16 4DN.

It is concluded that the Indicative Lighting Strategy provides an appropriate outline of the lighting requirements for the Proposed Development as part of the Application, and identifies potential measures to adequately provide full compliance with the following guidance documents:

- The Institute for Lighting Processionals Guidance Note 01 - The Reduction of Obtrusive Light (2021) GN 01/21
- The Institute for Lighting Processionals Guidance Note 08 - Bats and Artificial Lighting at Night (2023) GN 08/23

2 PROJECT DESCRIPTION

ION Consulting Engineers have been commissioned by Arun District Council to undertake a pre-development Lighting Strategy Report for the proposed redevelopment of the Palmer Road Sport Hub site.

Within this report the land areas will be referred to as the 'site'.

2.1 OBJECTIVE

The objective of this report is to assess the scope of the legislation, policy, guidance, standards and planning conditions relating to the installation and operation of suitable lighting across the site, and to establish a robust lighting strategy that demonstrates full compliance with these conditions.

The proposed scheme will provide full compliance with the following guidance documents:

- The Institute for Lighting Processionals Guidance Note 01 - The Reduction of Obtrusive Light (2021) GN 01/21.
- The Institute for Lighting Processionals Guidance Note 08 - Bats and Artificial Lighting at Night (2023) GN 08/23.

The project teams have been advised that a detailed lighting design will not be required for the initial planning application. As such, the final luminaire selection, positions of luminaires and lighting calculations are not included within this report.

The report will define the technical strategy from which a future detailed lighting design will be developed. At the detailed design stage, a computational light modelling exercise will be undertaken.

2.2 SITE ADDRESS

The site comprises the following proposed development:

Development	Address
Palmer Road Sports Hub	Decoy Drive Angmering, Littlehampton BN16 4DN

3 ILP GN01/21 - THE REDUCTION OF OBTRUSTIVE LIGHT

3.1 ILP GUIDANCE INTRODUCTION

ILP GN01/21 provides guidance for limiting the effect of obtrusive light and minimising the impact of skyglow by outdoor lighting installations. The publication is closely aligned with the following CIE (International Commission on Illumination) technical documents:

- CIE 150 (2017) Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations.
- CIE 126 (1997) Guidelines for minimizing Sky Glow.

The guidance note firstly describes the various types of lighting pollution:

- Sky Glow - Light that contributes to the brightening of the night sky.
- Glare – The uncomfortable brightness of a light source when viewed against a darker background.
- Light Intrusion – The spilling of light beyond the boundary of the property or area being lit.

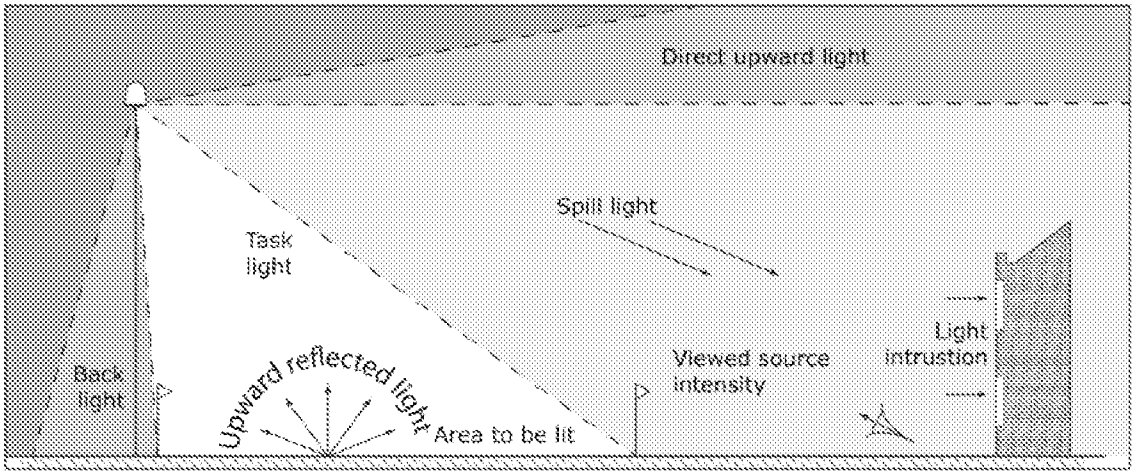


Figure 1: ILP GN01/21 Types of Obtrusive Light

The guidance then defines a series of environmental zones that must be assigned to areas within the project site. See section 'ILP Environmental Zone Classification' below for further details.

A range of technical lighting criteria is then provided within the guidance that is specific to both the environmental zone and the time of day. The time-based criteria are defined by 'pre-curfew' and 'post-curfew' periods. The 'curfew' is the time after which stricter requirements for the control of obtrusive light will apply. Curfew times often commence between 21:00 to 23:00 and may run until 07:00.

Whilst the guidance note is generally intended for the control of obtrusive light affecting residential receptors it can be considered equally relevant to non-residential human receptors i.e. for the preservation of night-time views from vantage points. See section 'Obtrusive Light Receptors' below for further details.

The internal and external lighting scheme for the Palmer Road development will be designed, installed and comissioned to provide a solution that is compliant with all relevant design criteria included within the ILP GN01/21 guidance document.

3.2 ILP ENVIRONMENTAL ZONE CLASSIFICATION

The environmental zones defined with GN01/21 have been established to categorise a set of technical lighting parameters that are proportional to the environment within which the site is located. The environmental zones range from protected rural (E0), through to urban environments (E4). Where an area to be lit lies within visual distance of the boundary between two zones then the obtrusive light values applicable to the most rigorous zone shall apply.

It is considered appropriate to categorise the Site as being within an Environmental Zone 3 'Suburban' (see Appendix A).

The Palmer Road Sport Hub is located outside of the South Downs National Park and those does not need to comply with the SDNP Dark Skies TAN.

3.3 OBTRUSTIVE LIGHT RECEPTORS

Residential Receptors:

Residential light-sensitive receptor locations have been identified at the following locations:

Palmer Road Sport Hub:

- Residential properties adjacent to either side of the main site entrance.
- Residential properties adjacent to southern boundary of the site.

Road Receptors:

Road Receptor locations have been identified at the following locations:

- Nonapplicable

3.4 ILP DESIGN CRITERIA AND MITIGATION RESPONSE

The following ILP GN01/21 technical lighting guidance criteria are relevant to the design of the lighting scheme at Palmer Road Sports Hub. A summary of the guidance, limiting values, and project specific response are provided. For further details refer to the External Lighting Strategy section of this report.

Guidance 1: Limitation of illumination of surrounding properties	
Summary	This guidance imposes limits to the maximum values of vertical illuminance at windows of nearby existing or potential dwellings / premises. The values are the summation of all lighting installations within the proposed site.
Limiting Values	Environmental Zone E3: ▪ The pre-curfew limit on vertical illuminance = 10 lux @ surrounding property windows. ▪ The post-curfew limit on the vertical illuminance <2 lux @ surrounding property windows.
Project Response	The residential properties are located a significant distance from the areas that are proposed to be illuminated within the site. All luminaires will be specified as LED type with flat modern optics and an upward lighting ratio (ULR) of 0. The selection, placement and optical design of the luminaires will prevent vertical illumination of the surrounding property windows. The control of the luminaires will prevent the operation of luminaires close to the residential boundaries outside of curfew hours. As such, the post-curfew limit will automatically be satisfied. The detailed lighting design will include desktop calculation of the vertical illuminance of lighting at surrounding properties to ensure compliance with the guidance. The lighting calculation will include screening via permanent structures (i.e. buildings and fences) however natural landscaping will not be included in the calculation as the screening effect may vary over time.
Guidance 2: Limitation of bright luminaires in the field of view	
Summary	This guidance imposes limits to the maximum values for the luminous intensity of luminaires in designated directions where views of bright surfaces of luminaires are likely to be a nuisance to occupants of premises, or from positions where such views are likely to be maintained. i.e. not for momentary or short-term viewing. The limits for the luminous intensity of bright luminaires are dependent on the viewing distance (d) between the observer and the luminaire(s), and the projected area (A_p), (bright part of the luminaire) of the light source seen from the observer position.

Limiting Values	Environmental Zone E3: ▪ The pre-curfew limit on the maximum luminous intensity emitted by luminaire (candela) = see table in Appendix. ▪ The post-curfew limit on the maximum luminous intensity emitted by luminaire (candela) = see table in Appendix.
Project Response	Where required, additional shields will be installed on the rear of the luminaires to mask the apparent surface (bright part of the luminaire) from the observer position during pre-curfew periods. The control of the luminaires will prevent their operation of luminaires close to the residential boundaries outside of curfew hours. As such, the post-curfew limit will automatically be satisfied. The observer positions are considered to be the windows of the residential properties. No other maintained viewing positions are anticipated.
Criteria 3: Limitation on the effects of transport systems	
Summary	This guidance imposes limits where users of road networks are subject to a reduction in the ability to see essential information. CIE 150 2017; Table 4 gives values that are for relevant positions and for viewing directions in the path of travel.
Limiting Values	Environmental Zone E3: ▪ Veiling luminance (L_v) 0.037 cd/m^2 ▪ Threshold Increment (TI) 15% based on adaption luminance of 0.1 cd/m^2
Project Response	Roadway illumination by local authority - nonapplicable. The constraints criteria will be confirmed during the detailed design stage.
Guidance 4: Limitation of skyglow	
Summary	This guidance imposes limits on the proportion of light that is emitted at or above the horizontal when a luminaire is mounted in its installed position. This is defined as the Upwards Light Ratio (ULR) of a luminaire. It should be noted that this metric does not consider the effect of light reflected upwards from the ground that also contributes to skyglow. Due to light pollution, the night sky over many of our cities is hundreds of times brighter than a natural starlit sky. Skyglow is the diffuse luminance of the night sky arising from artificial lighting.
Limiting Values	Environmental Zone E3: ▪ The limit on Upward Lighting Ratio (ULR) % = 5
Project Response	All luminaires will be specified as LED type with flat modern optics, an upward lighting ratio (ULR) of 0 and installed at a tilt of 0 degrees from the horizontal. The detailed lighting design will include calculation of the upwards lighting ratio (ULR) of the complete installation to ensure compliance with the guidance.
Criteria 5: Limitation of the effect of over-lit building facades and signs	
Summary	This guidance imposes limits on the luminance values that provide visibility in order that a balanced urban lighting master plan can be considered. This lighting does not cause negative impacts such as a continuous increase in the lighting levels (or ratcheting) between buildings and within areas creating light pollution.

Limiting Values	Environmental Zone E3: ▪ Pre-curfew Building façade luminance (L_b) < 10 cd/m^2 ▪ Post-curfew Building façade luminance (L_b) < 10 cd/m^2 ▪ Pre-curfew Sign luminance (L_s) 800 cd/m^2 ▪ Post-curfew Sign luminance (L_s) 800 cd/m^2
Project Response	The 'limitation of skyglow' imposes limits on the maximum values of upward light ratio (ULR) Residential properties are located a significant distance from the areas that are proposed to be illuminated within the site. The specification of LED luminaires with modern optics and ULR=0 and will allow beam control to prevent illumination of surrounding properties. The control of the luminaires via a centralised BMS system will prevent the normal operation of luminaires close to the residential boundary outside of curfew hours. The detailed lighting design will include calculation of the vertical illuminance of lighting at surrounding properties to ensure compliance with the guidance.

4 SDNP - DARK SKIES TECHNICAL ADVICE NOTE

4.1 SDNP GUIDANCE INTRODUCTION

The application site is neither located inside or adjacent to the National Park, the Council has no statutory duty to consider the Purposes of the National Park when making its determination.

5 ILP GN08/23 – BATS AND ARTIFICIAL LIGHTING AT NIGHT

5.1 ILP GUIDANCE INTRODUCTION

The ILP has proposed bats and artificial lighting at night guidance to raise awareness of the impacts of artificial lighting on bats but also the potential solutions to avoid and reduce this harm.

The internal and external lighting scheme for Palmer Road Sports Hub development will be designed, installed and comissioned to provide a solution compliant with all relevant design criteria included within ILP GN08/23

5.2 ILP DESIGN CRITERIA AND MITIGATION RESPONSE

The following ILP GN01/21 technical lighting criteria are relevant to the design of the lighting scheme at Palmer Road Sports Hub. A summary of the criteria, limiting values, and project specific response are provided. For further details refer to the External Lighting Strategy section of this report.

ILP GN01/23 Appropriate luminaire specification	Response
All luminaires should lack UV elements when manufactured.	All luminaires to be LED warm white type, with low intensity in the 100-400 wavelength range (UV).
LED luminaires should be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability	
A warm white light source (2700Kelvin or lower) should be adopted to reduce blue light component.	
Light sources should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.	
Internal luminaires can be recessed where installed in proximity to windows to reduce glare and light spill.	The lighting design will comply with all necessary glare and light spill requirements as defined within ILP GN01/21. The detailed lighting design will include desktop calculation that includes internal lighting installed in close proximity to windows to confirm compliance.
Waymarking inground markers (low output with cowls or similar to minimise upward light spill) to delineate path.	Not applicable to scheme.
Column heights should be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.	The lighting design will comply with all necessary glare and light spill requirements as defined within ILP GN01/21.
Only luminaires with a negligible or zero Upward Light Ratio, and with good optical control, should be considered.	All luminaire to comprise flat optics
Luminaires should always be mounted horizontally, with no light output above 90° and/or no upward tilt.	

Where appropriate, external security lighting should be set on motion-sensors and set to as short a possible a timer as the risk assessment will allow. For most general residential purposes, a 1- or 2-minute timer is likely to be appropriate.	The control of the luminaires via a centralised BMS system will prevent the normal operation of luminaires close to the residential boundary outside of curfew hours. Luminaires adjacent to staff entrance doors will be PIR controlled on short duration timer and will turn on outside of business operating hours if a person approaches.
Use of a Central Management System (CMS) with additional web-enabled devices to light on demand.	Luminaires will be interfaced to building BMS systems to ensure lighting is turned off outside of business hours.
Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.	Detailed lighting design will seek to provide a lighting design without these options; however they will be considered if necessary.

6 EXTERNAL LIGHTING STRATEGY

6.1 INTRODUCTION

The lighting scheme outlined in this report is to be viewed as a lighting design strategy rather than a detailed design solution.

Careful consideration has been given to the production of an external lighting strategy which satisfies the applicable external lighting policies, whilst also maintaining an adequate level of illuminance for the activities with the site.

6.2 TECHNICAL SPECIFICATION

Illuminance & Uniformity

The following table summarises the design illuminance and uniformity targets for the external lighting installation across the site. The targets are sourced for ILP and SLL recognised publications to ensure both the visual comfort and safety of users.

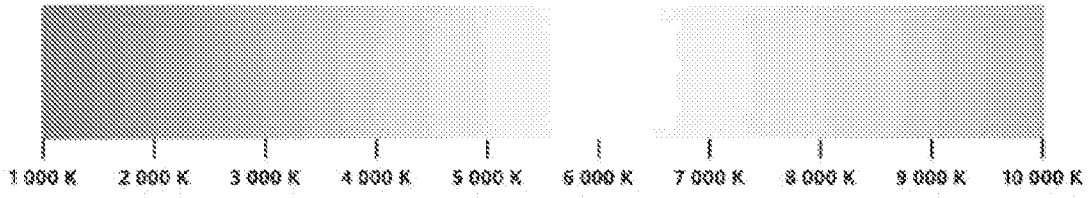
The calculation plane for the illuminance and uniformity targets stated below is ground level.

Location	Source Guidance Document	Average illuminance E_m – lux	Uniformity U_o
Pedestrian Routes	BS EN 12464-2:2014 Table 5.1 Walkways exclusively for pedestrians.	5	0.25
Car Park	BS EN 12464-2:2014 Table 5.9 Parking Areas - 5.9.2 Medium Traffic	10	0.25
Heavy Goods Vehicle Routes	BS EN 12464-2:2014 Table 5.1 General requirements for areas – 5.1.3 Regular vehicle traffic	20	0.4
Loads Bays and Manoeuvring Areas	BS EN 12464-2:2014 Table 5.1 Pedestrian passages, vehicle turning, loading and unloading points	50	0.4
External Sales Areas (Covered)	SLL Code for Lighting 2018	400	0.6
External storage areas without heavy goods vehicle access	SLL Code for Lighting 2018	20	0.25
Sport Lighting AGP & MUGA pitches	FA / FIFA Class II - Competition	>200	>0.6
	FA / FIFA Class II – Cross Play	>120	>0.6
	FA / FIFA Class II - Training	>120	N/A

Colour Temperature

Colour temperature is conventionally expressed in kelvins, using the symbol K, the unit for absolute temperature. Colour temperatures in the <3000K range (yellow colour spectrum) have a warm white colour temperature whilst colours in the 4000K range have a natural white appearance. Temperatures >4000K (blue colour spectrum) have a cool white appearance.

Guidance from the ILP GN08/23 states that luminaires with a warm white spectrum are preferential as bats are more affected by the blue light component.



Location	Source Guidance Document	Colour Temperature K
Pedestrian Routes	GN08/23 Bats and Artificial Lighting at Night	2700
Car Park	GN08/23 Bats and Artificial Lighting at Night	2700
Heavy Goods Vehicle Routes	GN08/23 Bats and Artificial Lighting at Night	2700
Loads Bays and Manoeuvring Areas	GN08/23 Bats and Artificial Lighting at Night	2700
External Sales Areas (Covered)	SLL Code for Lighting 2018	4000
External storage areas without heavy goods vehicle access	GN08/23 Bats and Artificial Lighting at Night	2700
Sports Pitches	Refer to 'SSL' Sports Lighting Statement Appendix C	-

Colour Rendering

Colour rendering qualities of light refers to their ability to reproduce the colour of objects being illuminated. A colour rendering of greater than 60 Ra allows lower levels of illuminance to be specified and promotes a feeling of safety for pedestrians. Lighting that is being provided for safety, security and for fear of crime reducing purposes should have good colour rendering qualities i.e. a rating of 70 or above on the colour rendering index.

The CRI value of the LED's for external luminaires will not be less than CRI70.

Calibration:

External luminaires will comprise Digital Addressable Lighting Interface (DALI) dimmable control gear to provide increased lighting control. The system will allow for external lighting to be accurately calibrated on-site to design lux levels during commissioning. Additionally, rather than over-lighting the spaces initially to compensate for lumen output depreciation over the lifetime of the luminaires (maintenance factor) the luminaires output can be re-calibrated over their lifetime accordingly.

Controls:

Centralised automatic lighting controls will generally be provided for external luminaires comprising a combination of timeclock, photocell and BMS system input. The system will allow the lighting to operate with minimal user intervention thus ensuring luminaires are not unintentionally operated outside of their intended operating parameters.

The BMS trigger for 'close of-business' will be the arming of the security alarm system for the respective site. A run-on-timer of approximately 10 minutes will ensure the user has sufficient time to exit the site prior to the deactivation of the associated luminaires.

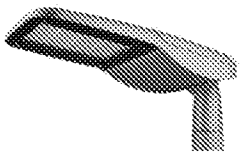
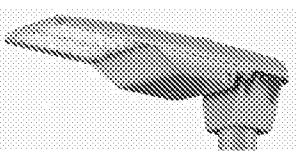
Override / isolation switches will be provided to provide routine maintenance and testing of the lighting.

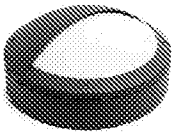
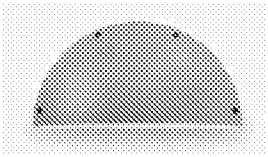
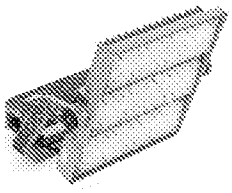
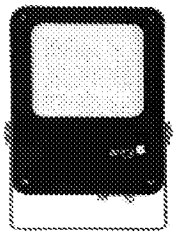
Location	Control
Car Park & Car Park	Luminaires switched on automatically via timeclock and photocell control. Installation zoned to allow different areas of the car park & access road to be controlled independently.
External Signage (building mounted).	Luminaires switched on automatically via timeclock and photocell control. Luminaires to switch off at close of business via centralised BMS link trigger from the arming of the building security alarm.
External Delivery Area	Luminaires switched on automatically via timeclock and photocell control. Luminaires typically dimmed to 10 lux during opening hours. Local sensors to temporarily increase all delivery area lighting to 50 lux upon occupancy to provide safe lighting for movement of heavy good vehicles. Lighting returns to nominal levels after period of 10 mins of no detection. Luminaires to switch off at close of business via centralised BMS link trigger from the arming of the building security alarm.

Luminaire Selection

Dark Sky International (DSI) provides a Fixture Seal of Approval programme that certifies outdoor lighting fixtures as being Dark Sky Friendly, meaning that they minimise glare while reducing light trespass, sky glow and the amount of blue light in in the night-time environment. The programme is endorsed by SDNPA as providing 'good examples' of lighting products. It should be noted that it is not necessary for a luminaire to be approved via this scheme if all technical parameters are otherwise satisfied for the chosen product.

The following table show example luminaires awarded the DSI Fixture Seal of Approval, and which satisfy all requirements of the planning requirements. Whist the selection of luminaires will be confirmed during detailed design the products the images provide an example of the luminaire types suitable for installation at the site.

Luminaire Type	Location	Example Luminaire Images	
Post top Luminaires (Functional)	Car Parks and Service Yards		

Wall Mounted Luminaires	Generally at buildings		
Flood Lighting	3G AGP & MUGA Pitch		

Luminaire selection (Illuminated advertisements)

Luminaire Type	Location	Example Luminaire Images
Advertising board	Pavilion Building	*TBC*
Entrance signage	Roadway entrance	*TBC*

Installation strategy:

Luminaires should be used that have good optical control and an option for installing shields as this can be an effective method of shielding the source intensity and reducing both horizontal and vertical spill light.

All luminaires will be provided with a tilt of 0 degrees from the horizontal.

Luminaire installed close to the development boundary will be positioned and orientated such that the optics are facing away from the boundary.

Security lighting requires some vertical illuminance in order to help CCTV cameras reproduce detail to a good standard. Security lighting should be carefully designed to ensure that vertical illuminance does not fall outside of the required areas.

The site shall typically be lit using luminaries mounted on 5m columns, complemented by wall mounted luminaries where appropriate.

APPENDIX A: ILP GN01/21 ENVIRONMENTAL ZONES

The following table summarises the Environmental Zone Classification within ILP GN01/21.

1 ILP GN01/21 Table 2: Environmental Zones

ILP Guidance Note 1 – Reduction of Obtrusive Light (2021)			
Zone	Surrounding	Light Environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO Starlight Reserves, IDA dark sky places...
E1	Natural	Intrinsically dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Beauty, IDA buffer zones etc..
E2	Rural	Low district brightness (SQM ~ 15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations.
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations.
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity.

APPENDIX B: SOUTH DOWNS NATIONAL PARK – ZONAL LIGHTING POLICIES

The following table summarises the application of policies within the SDNP Dark Skies TAN with respect each Environmental Zone Classification.

Note: Environmental Zone E2 is not used within the SDNP Dark Skies TAN.

2 SDNP Dark Skies TAN Version 2 May 2021 - Table 1 Zonal Lighting Policies

ILP Guidance Note 1 – Reduction of Obtrusive Light (2021)				South Downs National Park Dark Skies TAN (2021)					
Zone	Surrounding	Light Environment	Examples	Section 9.1 ILP Guidance	Section 9.2 Design Impact	Section 9.3 Max Lux	Section 9.4 Preferred Night Usage Curfew	Section 9.4 Preferred Evening Curfew	Section 9.4 Preferred Astronomical Curfew
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO Starlight Reserves, IDA dark sky places...	X	X	X			X
E1(a)	Natural	Intrinsically dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Beauty, IDA buffer zones etc..	X	X	X		X	
E1(b)	Natural	Transition (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Beauty, IDA buffer zones etc..	X	X	X	X		
E2	Rural	Low district brightness (SQM ~ 15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations.	N/A	N/A	N/A	N/A	N/A	N/A
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations.	X	X		X		
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity.	X	X		X		

APPENDIX C: LIGHTING REPORTS AND LUX PLOTS

Lighting Specialist / Reference:	Title:
GL / MUGA - Palmer Road Sport Hub Lighting Report – V2 – 12-11-2024	MUGA - Palmer Road Sports Hub Lighting Report
GL / MUGA - Palmer Road Sport Hub LUX Isolines – V2 – 12-11-2024	MUGA - Palmer Road Sports Hub LUX Isolines
GL / Palmer Road Sports Hub Lighting Report – V3 – 12-10-2024	Road, Car Park and External Building Lighting Report
GL / Palmer Road Sports Hub 3D LUX Plot – V3 – 12-10-2024	Road, Car Park and External Building Lighting 3D LUX Plot
SSL / Appendix A - AGP Lighting Performance Report	3G Artificial Grass Pitch Performance Report
SSL / Appendix B - AGP Sports Lighting Statement	3G Artificial Grass Pitch Sports Lighting Statement

DATE:	**12 November 2024**
DESIGNER:	**Lucien McQueen**
PROJECT No:	**HM270824-2**
PROJECT NAME:	**MUGA - Palmer Road Sports Hub**

Outdoor Lighting Report

DISCLAIMER:

The information contained in this lighting plan is provided solely for guidance only. Gemma Lighting recommends that, where LUX levels are business critical, a comprehensive lighting plan is completed by a qualified lighting designer or architect.
Liability claims regarding damage caused by the use of any information provided, including any kind of information which is incomplete or incorrect, will therefore be rejected.

Layout Report

General Data

Dimensions in Metres Angles in Degrees
Grid Origin -2021.8m x -163.8m
Area 154.9m x 109.5m
Sample Spacing 1.49m x 1.50m

Luminaires

Luminaire A Data

Supplier	Gemma Lighting
Type	Drayton 200W - Optic 2
Lamp(s)	DR200-AN-00B-2
LampFlux(klm)/Colour	23.27 4000K/Ra70
File Name	Drayton 200W - 4K - Optic 2.ldt
Maintenance Factor	0.90
Imax70,80,90(cd/klm)	337.8, 33.0, 0.0
No. in Project	8

Layout

ID /Mast	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1/1	A	-1926.28	-116.52	10.00	269.38	5.00	0.00	0.00	-1926.32	-120.56	0.00
2/1	A	-1926.28	-116.52	10.00	298.14	5.00	0.00	0.00	-1924.37	-120.09	0.00
3/2	A	-1906.49	-112.21	10.00	273.01	5.00	0.00	0.00	-1906.27	-116.24	0.00
4/2	A	-1906.49	-112.21	10.00	298.61	5.00	0.00	0.00	-1904.55	-115.75	0.00
5/3	A	-1922.46	-136.24	10.00	113.20	5.00	0.00	0.00	-1924.05	-132.52	0.00
6/3	A	-1922.46	-136.24	10.00	88.00	5.00	0.00	0.00	-1922.32	-132.20	0.00
7/4	A	-1902.72	-131.86	10.00	119.25	5.00	0.00	0.00	-1904.69	-128.34	0.00
8/4	A	-1902.72	-131.86	10.00	88.00	5.00	0.00	0.00	-1902.58	-127.82	0.00

851485440

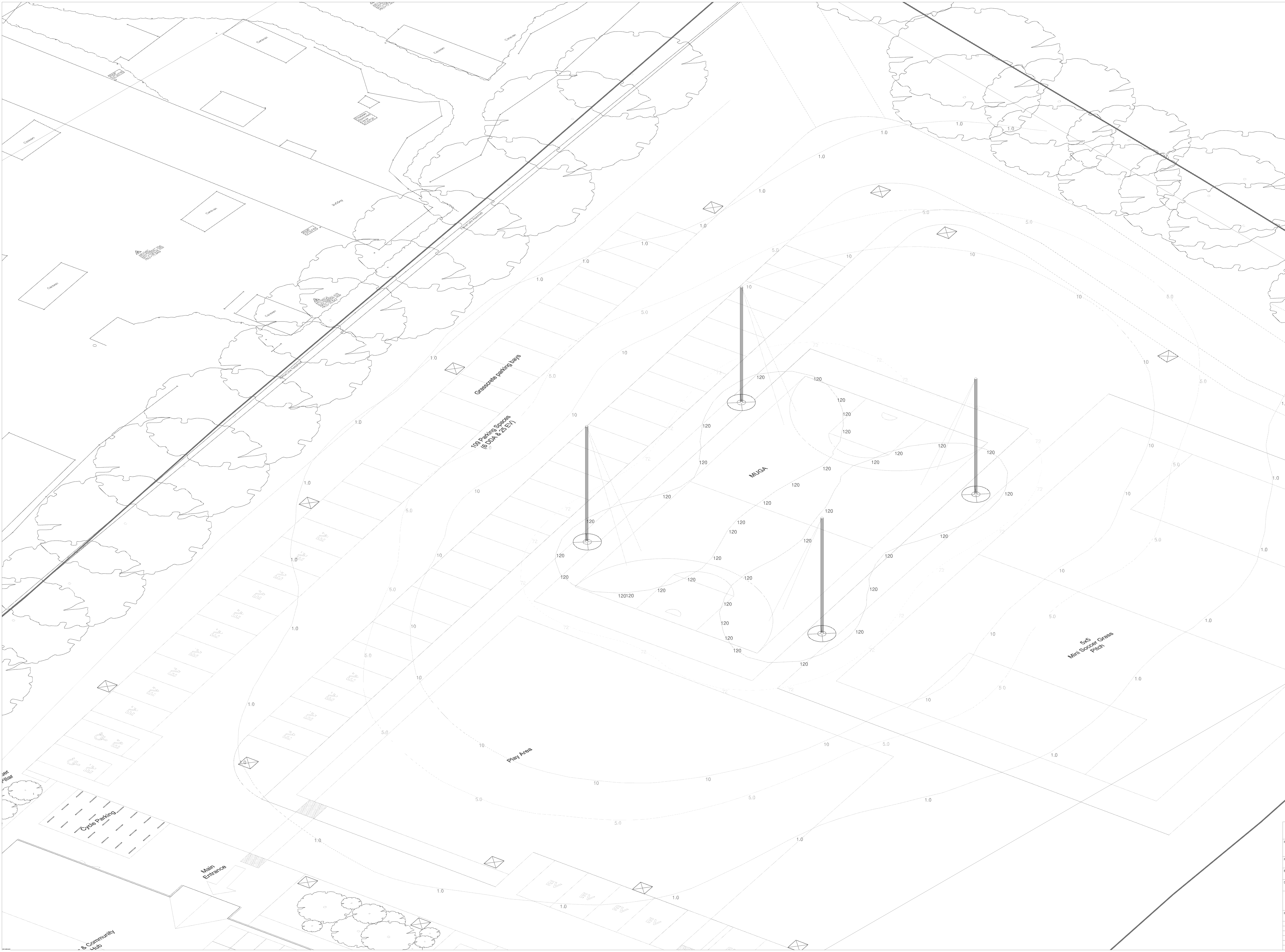
Horizontal Illuminance (lux)

MUGA

Results

Eav	125.70
Emin	72.44
Emax	172.83
Emin/Emax	0.42
Emin/Eav	0.58

851485440



gemma lighting

PROJECT NAME:
MUGA - Palmer Road Sports Hub

PROJECT No:
HM270824-2

SCALE:
1:100

DATE:
12 November 2024

DESIGNER:
Lucien McQueen

PREPARED BY:

Results MUGA	
Eav	125.70
Emin	72.44
Emax	172.83
Emin/Emax	0.42
Emin/Eav	0.58

DATE:	**11 October 2024**
DESIGNER:	**CM**
PROJECT No:	**HM270824-1**
PROJECT NAME:	**Palmer Road Sports Hub - Arun District Council v3**

Outdoor Lighting Report

DISCLAIMER:

The information contained in this lighting plan is provided solely for guidance only.

Liability claims regarding damage caused by the use of any information provided,including any kind of information which is incomplete or incorrect, will thereforebe rejected.

\\gem-sr1\shares$\glsouth\a - quotations live\i\ion consulting limited\lighting plans\palmer road sports hub\palmer road sports v3 - 12-10-2024 a.rtma

Layout Report

General Data

Dimensions in Metres Angles in Degrees
Local Origin at -2012.32m x -224.32m
Grid Origin 0.0m x 0.0m
Area 201.2m x 150.6m
Sample Spacing 1.49m x 1.49m

Luminaires

Luminaire A Data

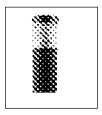
Supplier	Gemma Lighting
Type	Conquest 40W - 1
Lamp(s)	CQ40-A3W-00G-76
LampFlux(klm)/Colour	4.41 3000K/Ra80
File Name	Conquest 40W - 3K - Optic 1.ldt
Maintenance Factor	0.92
Imax70,80,90(cd/klm)	619.2, 93.2, 1.5
No. in Project	20

Luminaire B Data

Supplier	Gemma Lighting
Type	Conquest 40W - 3
Lamp(s)	CQ40-A3W-00G-76-3
LampFlux(klm)/Colour	4.41 3000K/Ra80
File Name	Conquest 40W - 3K - Optic 3.ldt
Maintenance Factor	0.92
Imax70,80,90(cd/klm)	752.1, 42.0, 0.0
No. in Project	4

Luminaire C Data

Supplier	Gemma Lighting
Type	Mayfair 10W - 1 (EMG)
Lamp(s)	MF10-A1W-01GH-1
LampFlux(klm)/Colour	1.16 3000K/Ra80
File Name	Mayfair 10W - 3K - Optic 1.ldt
Maintenance Factor	0.92
Imax70,80,90(cd/klm)	618.2, 207.7, 0.0
No. in Project	16



Luminaire D Data

Supplier	Gemma Lighting
Type	Hamilton 20W (EMG)
Lamp(s)	HB20-A3W-01B
LampFlux(klm)/Colour	1.59 3000/Ra80
File Name	Hamilton 20W - 3K.ldt
Maintenance Factor	0.92
Imax70,80,90(cd/klm)	118.7, 282.3, 298.4
No. in Project	5

Layout

ID /Mast	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1	A	178.71	63.16	4.00	86.00	5.00	0.00	0.50			
2	A	153.87	63.53	4.00	90.00	5.00	0.00	0.50			
3	A	140.28	77.07	4.00	194.00	5.00	0.00	0.50			
4	A	139.05	101.76	4.00	178.00	5.00	0.00	0.50			
5	A	138.03	126.65	4.00	188.00	5.00	0.00	0.50			
6	A	115.52	135.66	4.00	283.00	5.00	0.00	0.50			
7	A	91.35	130.35	4.00	283.00	5.00	0.00	0.50			
8	A	67.39	124.58	4.00	283.00	5.00	0.00	0.50			
9	A	42.57	118.92	4.00	283.00	5.00	0.00	0.50			
10	A	119.23	119.57	4.00	108.00	5.00	0.00	0.50			

8514748932

Layout Continued

ID /Mast	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
11	A	95.04	114.15	4.00	106.00	5.00	0.00	0.50			
12	A	71.02	108.82	4.00	102.00	5.00	0.00	0.50			
13	A	53.20	104.54	4.00	103.00	5.00	0.00	0.50			
14	C	35.68	92.27	3.50	17.00	0.00	0.00	0.00			
15	A	49.89	91.62	4.00	193.00	5.00	0.00	0.50			
16	A	58.20	76.26	4.00	193.00	5.00	0.00	0.50			
17	A	41.88	71.90	4.00	11.00	5.00	0.00	0.50			
18	A	62.69	55.50	4.00	193.00	5.00	0.00	0.50			
19	A	67.94	31.15	4.00	193.00	5.00	0.00	0.50			
20	A	35.38	21.89	4.00	14.00	5.00	0.00	0.50			
21	A	31.21	42.61	4.00	17.00	5.00	0.00	0.50			
22	C	27.47	109.37	3.50	100.00	0.00	0.00	0.00			
23	C	19.77	107.63	3.50	100.00	0.00	0.00	0.00			
24	C	37.25	84.25	3.50	17.00	0.00	0.00	0.00			
25	C	32.27	107.55	3.50	9.00	0.00	0.00	0.00			
26	C	34.01	99.81	3.50	13.00	0.00	0.00	0.00			
27	C	39.01	76.55	3.50	17.00	0.00	0.00	0.00			
28	C	40.60	68.61	3.50	14.00	0.00	0.00	0.00			
29	C	37.28	64.46	3.50	285.00	0.00	0.00	0.00			
30	C	29.38	62.84	3.00	285.00	0.00	0.00	0.00			
31	C	25.00	64.96	3.00	195.00	0.00	0.00	0.00			
32	C	23.35	72.64	3.00	195.00	0.00	0.00	0.00			
33	C	21.50	80.52	3.00	195.00	0.00	0.00	0.00			
34	C	19.97	88.37	3.50	195.00	0.00	0.00	0.00			
35	C	18.36	96.18	3.50	195.00	0.00	0.00	0.00			
36	C	16.78	104.05	3.50	195.00	0.00	0.00	0.00			
37	D	10.94	68.54	1.00	281.00	0.00	0.00	0.00			
38	D	18.82	70.18	1.00	281.00	0.00	0.00	0.00			
39/1	B	47.34	49.61	4.00	286.00	5.00	0.00	0.50			
40/1	B	47.34	49.61	4.00	106.00	5.00	0.00	0.50			
41/2	B	52.33	26.53	4.00	288.00	5.00	0.00	0.50			
42/2	B	52.33	26.53	4.00	108.00	5.00	0.00	0.50			
43	D	13.54	55.19	1.00	281.00	0.00	0.00	0.00			
44	D	17.92	52.83	1.00	281.00	0.00	0.00	0.00			
45	D	25.73	54.32	1.00	281.00	0.00	0.00	0.00			

DATE: 11 October 2024 DESIGNER: CM

PROJECT No: HM270824-1 PROJECT NAME: Palmer Road Sports Hub - Arun District Council v3

gemma lighting

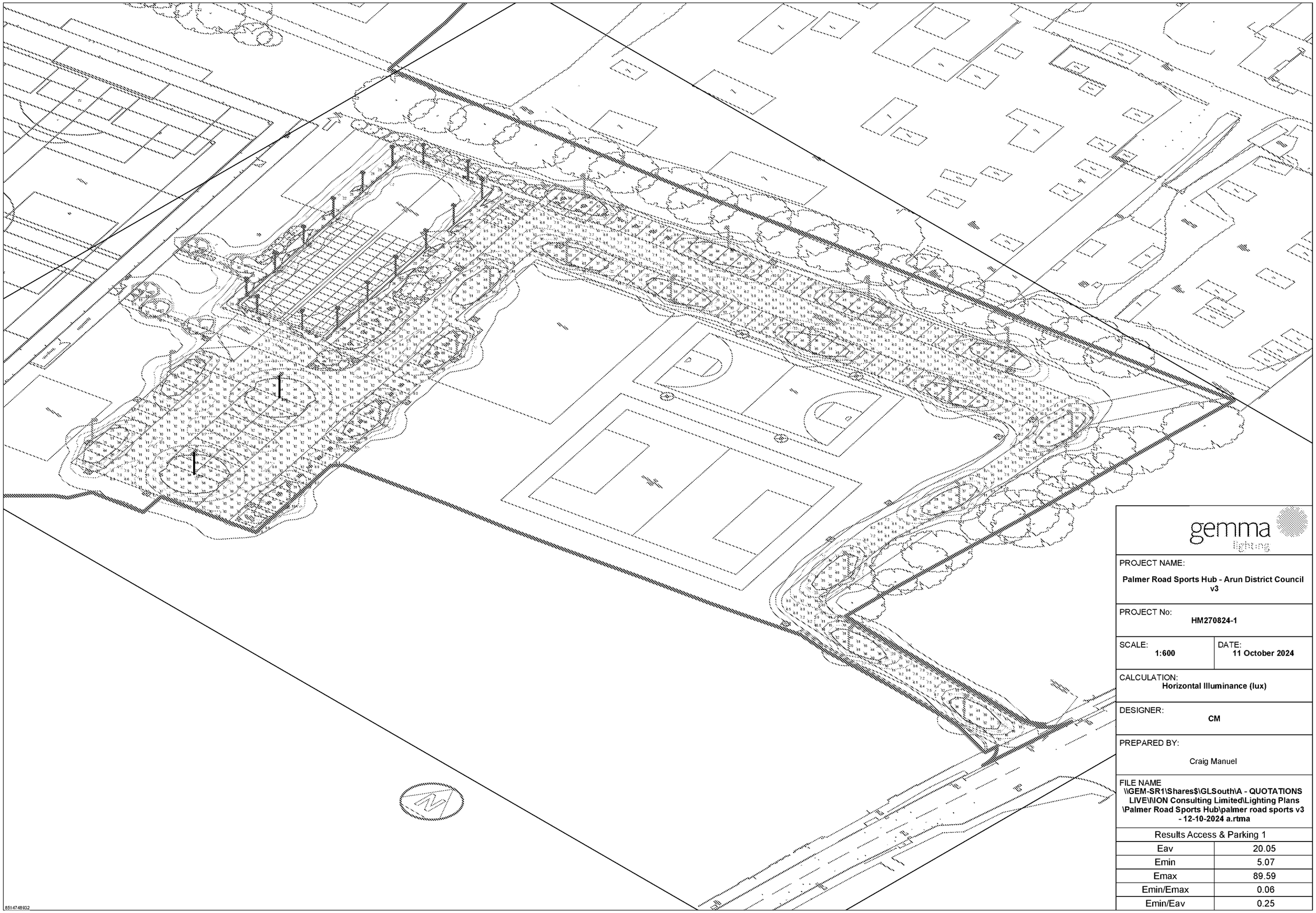
Horizontal Illuminance (lux)

Access & Parking 1

Results

Eav	20.05
Emin	5.07
Emax	89.59
Emin/Emax	0.06
Emin/Eav	0.25

8514748932



gemma lighting

PROJECT NAME: **Palmer Road Sports Hub - Arun District Council v3**	
PROJECT No: **HM270824-1**	
SCALE: **1:600**	DATE: **11 October 2024**
CALCULATION: **Horizontal Illuminance (lux)**	
DESIGNER: **CM**	
PREPARED BY: Craig Manuel	
FILE NAME **\\GEM-SR1\Shares$\GLSouth\A - QUOTATIONS LIVE\\ION Consulting Limited\Lighting Plans \Palmer Road Sports Hub\palmer road sports v3 - 12-10-2024 a.rtma**	

Results Access & Parking 1	
Eav	20.05
Emin	5.07
Emax	89.59
Emin/Emax	0.06
Emin/Eav	0.25

8514748932

Arun Sports Hub

Artificial Grass Pitch

Project code:	SSL3355
Date:	01-11-2024
Designer:	WB
Description:	Match play: Maintained average illuminance >200 lux Uniformity Ratio (Ev.min/Ev.ave) >0.60 All luminaires have a zero upward light ratio without the use of additional accessories.

The nominal values shown in this report are the result of precision calculations, based upon precisely positioned luminaires in a fixed relationship to each other and to the area under examination. In practice the values may vary due to tolerances on luminaires, luminaire positioning, reflection properties and electrical supply.

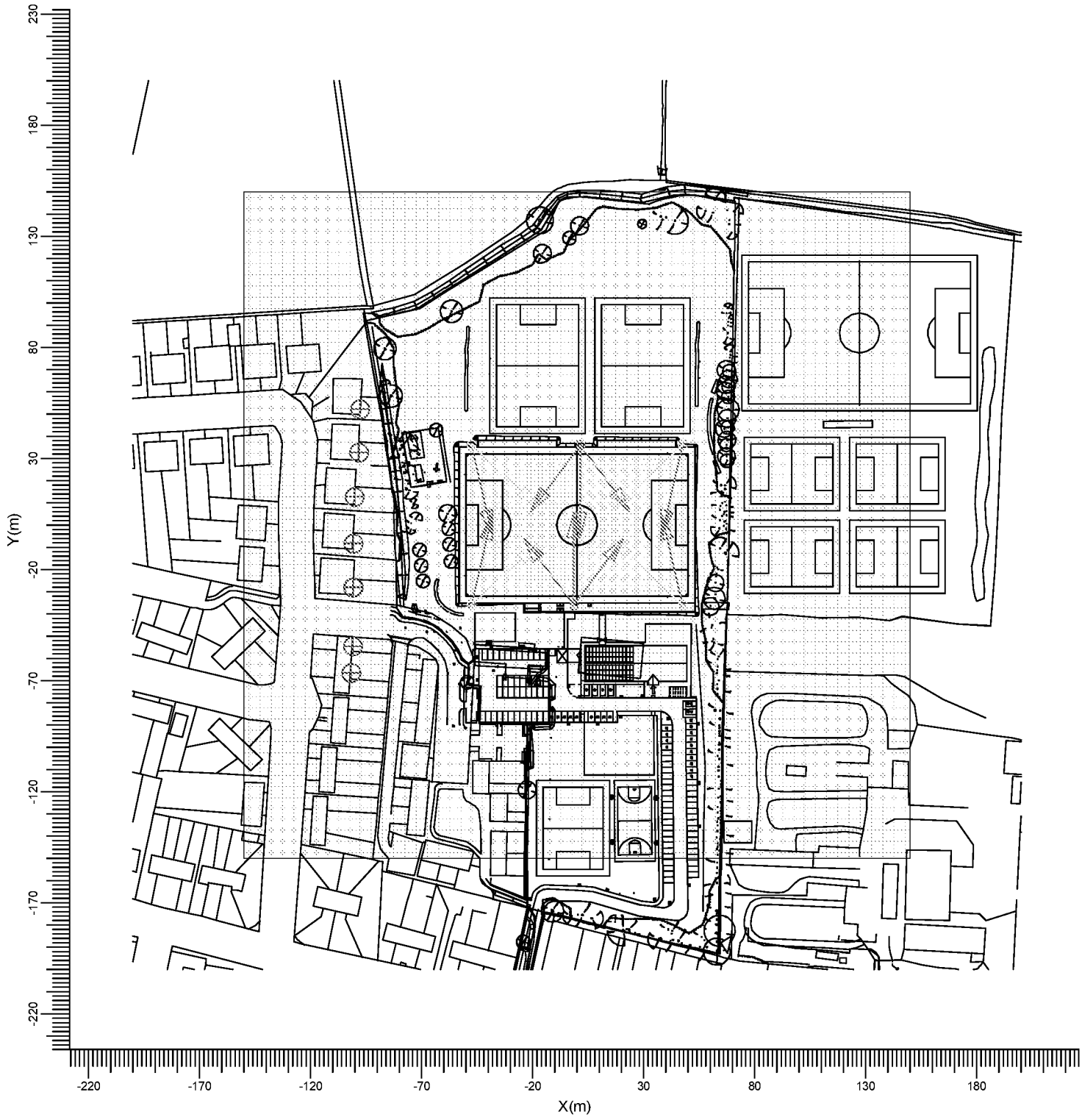
Surfacing Standards LTD
Office 2
Empingham House
Ayston Road
Uppingham
LE15 9NY

CalcuLuX Area 7.9.0.0

Table of Contents

1. Project Description

1.1 Top Project Overview



B	BVP528 A35-NB +BL	D	BVP518 OUT T35 A35-NB LO
F	BVP528 OUT T35 A35-NB LO	G	BVP528 OUT T35 A35-NB LTM
M	BGP291 T25 DN11		

Scale
1:2500

2. Summary

2.1 Observer Information

Code	Observer	Position		
		X (m)	Y (m)	Z (m)
Aa	House 1 - 1.8m	-98.34	32.80	1.80
Bb	House 1 - 3.6m	-98.34	32.80	3.60
Cc	House 2 - 1.8m	-100.14	12.71	1.80
Dd	House 2 - 3.6m	-100.14	12.71	3.60
Ee	House 3 - 1.8m	-100.81	-8.18	1.80
Ff	House 3 - 3.6m	-100.81	-8.18	3.60
Gg	House 4 - 1.8m	-100.91	-27.89	1.80
Hh	House 4 - 3.6m	-100.78	-27.89	3.60
Ii	House 5 - 1.8m	-97.84	52.20	1.80
Jj	House 5 - 3.6m	-97.68	52.20	3.60
Kk	House 6 - 1.8m	-101.10	-54.50	1.80
Ll	House 6 - 3.6m	-101.10	-54.50	3.60
Mm	House 7 - 1.8m	-101.81	-66.61	1.80
Nn	House 7 - 3.6m	-101.81	-66.61	3.60

2.2 Project Luminaires

Code	Qty	Luminaire Type	Lamp Type	Power (W)	Flux (lm)
D	6	BVP518 OUT T35 A35-NB LO	1 * LED1720-4S/740	1006.0	1 * 172000
F	4	BVP528 OUT T35 A35-NB LO	1 * LED2590-4S/740	1505.9	1 * 259000
G	4	BVP528 OUT T35 A35-NB LTM	1 * LED2590-4S/740	1505.9	1 * 259000

The total installed power: 18.08 (kWatt)

Number of Luminaires Per Switching Mode:

Switching Mode	Luminaire Code			Power (kWatt)
	D	F	G	
200lux Switching	6	4	4	18.08
120 Lux Switching	6	4	4	18.08
Spillage Switching	6	4	4	18.08

Number of Luminaires Per Arrangement:

Arrangement	Luminaire Code			Power (kWatt)
	D	F	G	
Mast 2	3	0	0	3.02
Mast 3	3	0	0	3.02
Mast1	0	4	4	12.05

2.3 Calculation Results

Switching Modes:

Code	Switching Mode	Maintenance factor
1	200lux Switching	0.95
2	120 Lux Switching	0.50
3	Spillage Switching	1.00

(Il)luminance Calculations:

Calculation	Switching Mode	Type	Unit	Ave	Min/Ave	Min/Max
Football 200 Lux	1	Surface Illuminance	lux	232	0.62	0.44
Football 120 Lux	2	Surface Illuminance	lux	122	0.62	0.44
Ground Spillage	3	Surface Illuminance	lux	21.6	0.00	0.00

Glare Rating for Grid of Observers:

Calculation	Switching Mode	Observer Grid	Reference Grid	Reflectance	GR-Max
Pitch Glare Rating	1	Football	Football	0.25	49.1

Obtrusive Light Calculations:

Switching Mode	Observer Code	Luminaire Code	Position			Aiming Angles			Maximum Intensity (cd)
			X (m)	Y (m)	Z (m)	Rot.	Tilt90	Tilt0	
3	Aa	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1202
3	Bb	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1253
3	Cc	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1390
3	Dd	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1289
3	Ee	G	47.50	36.00	15.00	-137.00	70.00	0.00	1425
3	Ff	G	47.50	36.00	15.00	-137.00	70.00	0.00	1300
3	Gg	G	47.50	36.00	15.00	-137.00	70.00	0.00	1337
3	Hh	G	47.50	36.00	15.00	-137.00	70.00	0.00	1332
3	Ii	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1007
3	Jj	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1055
3	Kk	G	47.50	36.00	15.00	-137.00	70.00	0.00	1012
3	Ll	G	47.50	36.00	15.00	-137.00	70.00	0.00	1063
3	Mm	G	47.50	36.00	15.00	-137.00	70.00	0.00	1043
3	Nn	G	47.50	36.00	15.00	-137.00	70.00	0.00	1102

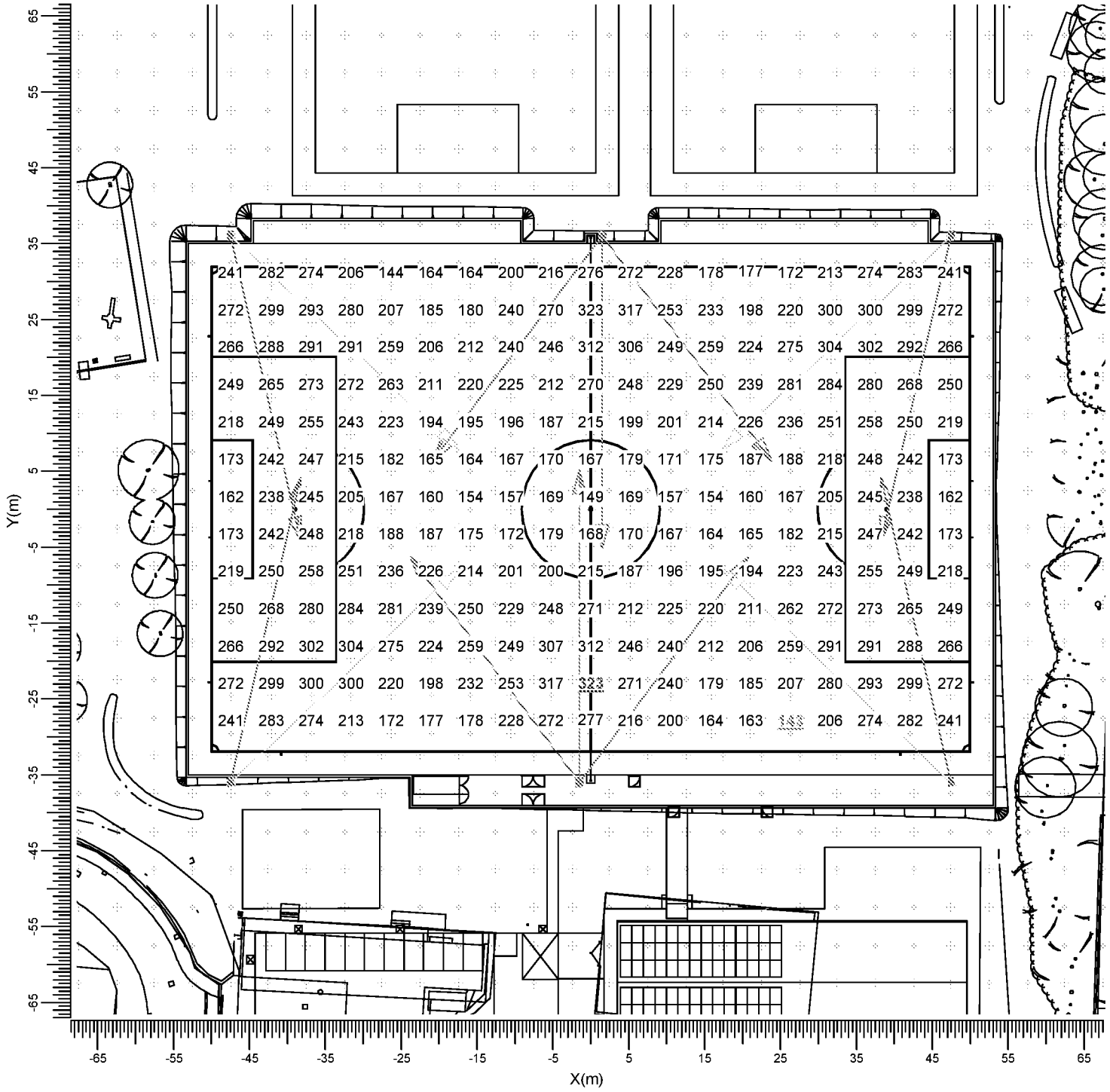
Switching Mode	ULR
1	0.00
2	0.00
3	0.00

3. Calculation Results

3.1 Football 200 Lux: Graphical Table

200lux Switching

Grid : Football at Z = -0.00 m
Calculation : Surface Illuminance (lux)



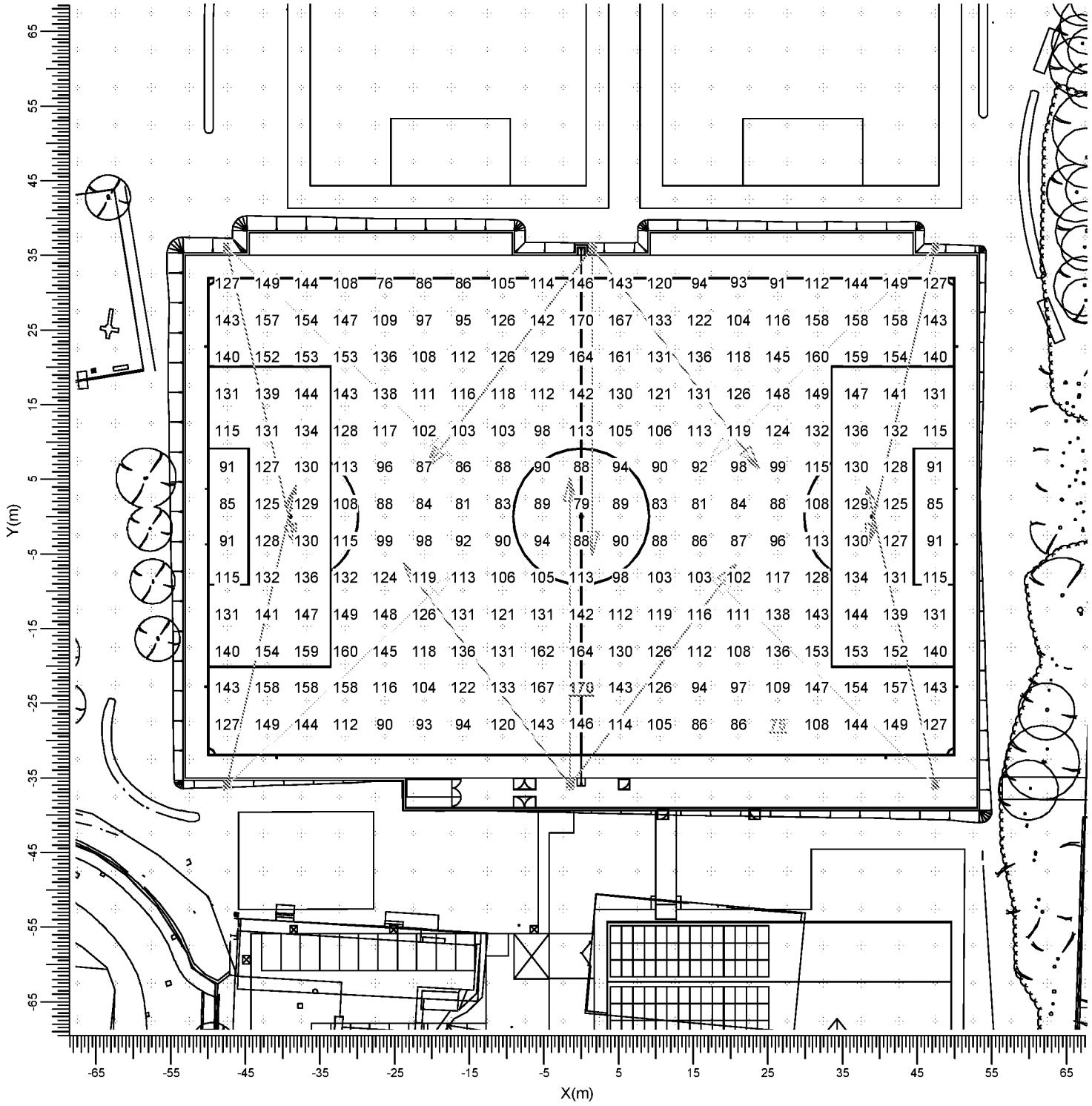
B ⟶ BVP528 A35-NB +BL
D ⟶ BVP518 OUT T35 A35-NB LO
F ⟶ BVP528 OUT T35 A35-NB LO
G ⟶ BVP528 OUT T35 A35-NB LTM

Average	Min/Ave	Min/Max	Project maintenance factor	Scale
232	0.62	0.44	0.95	1:750

3.2 Football 120 Lux: Graphical Table

120 Lux Switching

Grid : Football at Z = -0.00 m
Calculation : Surface Illuminance (lux)



D ⟶ BVP518 OUT T35 A35-NB LO
F ⟶ BVP528 OUT T35 A35-NB LO
G ⟶ BVP528 OUT T35 A35-NB LTM

Average	Min/Ave	Min/Max	Project maintenance factor	Scale
122	0.62	0.44	0.50	1:750

3.3 Ground Spillage: Filled Iso Contour

Spillage Switching

Grid : Spillage Grid at Z = -0.00 m
Calculation : Surface Illuminance (lux)

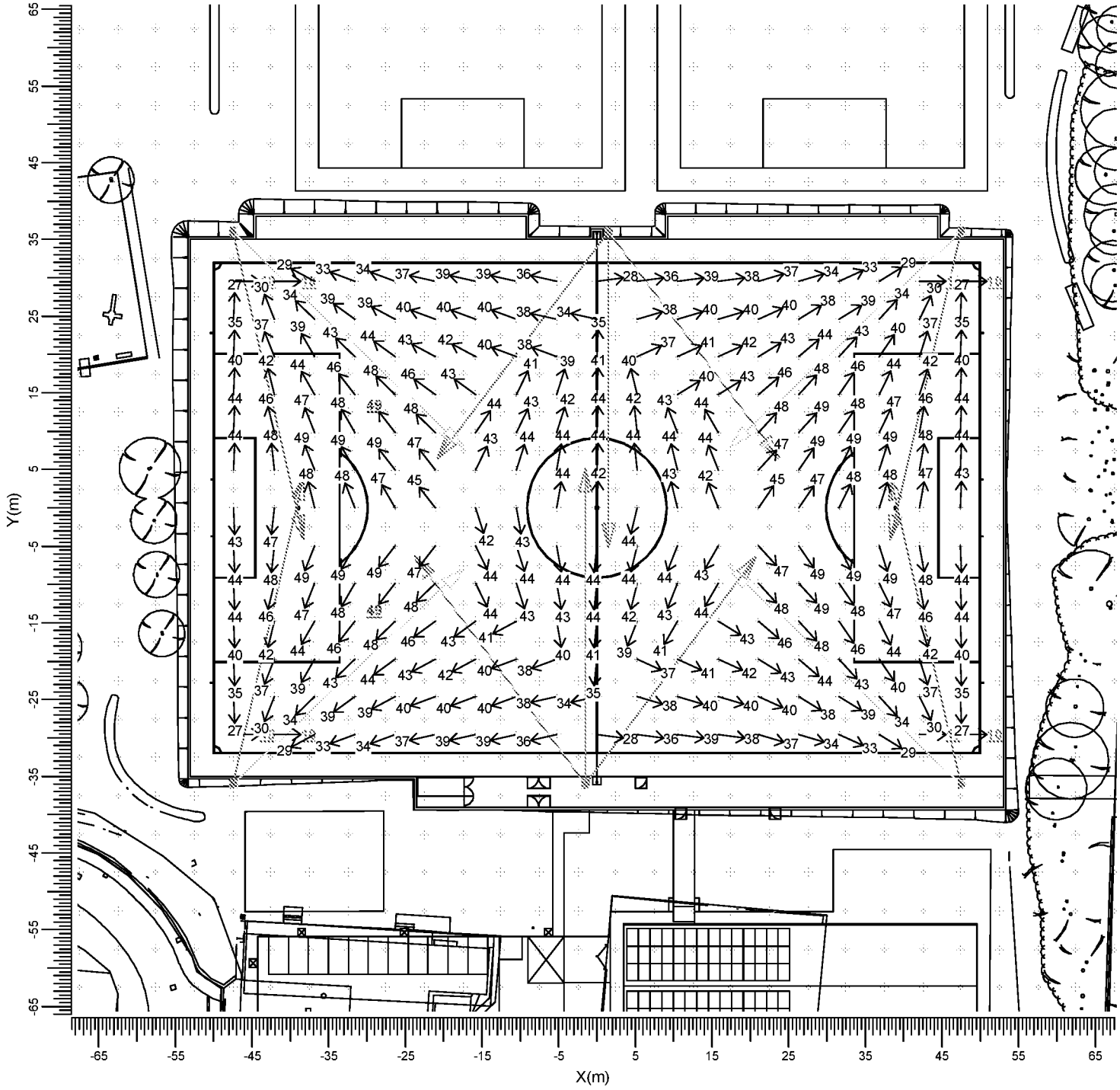
B	BVP528 A35-NB +BL		D	BVP518 OUT T35 A35-NB LO	
F	BVP528 OUT T35 A35-NB LO		G	BVP528 OUT T35 A35-NB LTM	
M	BGP291 T25 DN11				

Average	Min/Ave	Min/Max	Project maintenance factor	Scale
21.6	0.00	0.00	1.00	1:2500

3.4 Pitch Glare Rating: Graphical Table

200lux Switching

Grid of Observers : Football
Calculation : Glare Rating
Grid for Background Luminance: Football (Reflectance: 0.25)
Vertical Viewing Angle : -2.0 deg



B BVP528 A35-NB +BL
D BVP518 OUT T35 A35-NB LO
F BVP528 OUT T35 A35-NB LO
G BVP528 OUT T35 A35-NB LTM

Project maintenance factor
0.95

Scale
1:750

4. Luminaire Details

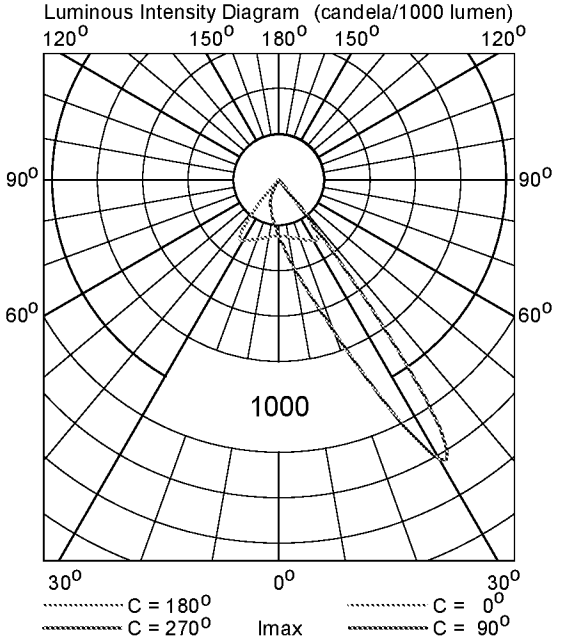
4.1 Project Luminaires

OptiVision LED gen3.5 2022
BVP518 OUT T35 1xLED1720-4S/740/740 E3/D4I A35-NB LO

Light output ratios
- DLOR : 0.59
- ULOR : 0.00
- TLOR : 0.59

Ballast : E3/D4I
Lamp flux : 172000 lm
Luminaire wattage : 1006.0 W
Measurement code : LVM2047300

Note: Luminaire data not from database.

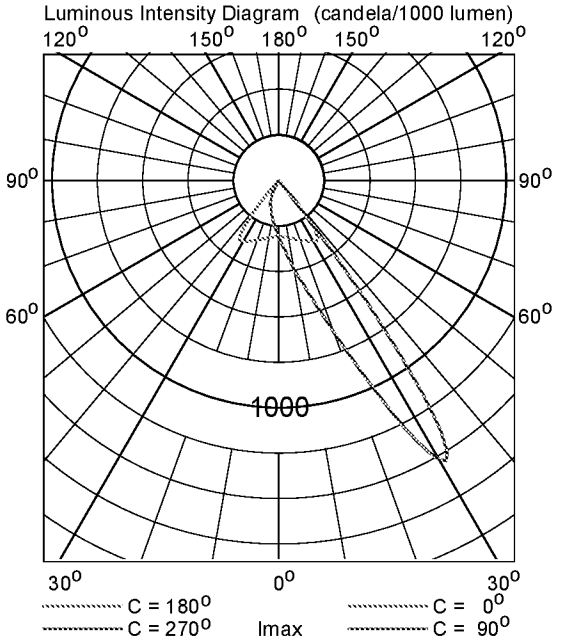


OptiVision LED gen3.5 2022
BVP528 OUT T35 1xLED2590-4S/740/740 E3/D4I A35-NB LO

Light output ratios
- DLOR : 0.59
- ULOR : 0.00
- TLOR : 0.59

Ballast : E3/D4I
Lamp flux : 259000 lm
Luminaire wattage : 1505.9 W
Measurement code : LVM2047300

Note: Luminaire data not from database.

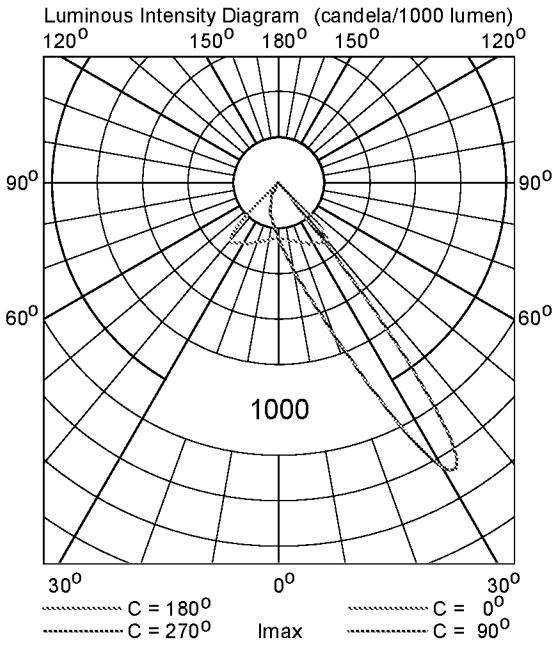


OptiVision LED gen3.5 2022
BVP528 OUT T35 1xLED2590-4S/740/740 E3/D4I A35-NB LTM

Light output ratios
- DLOR : 0.71
- ULOR : 0.00
- TLOR : 0.71

Ballast : E3/D4I
Lamp flux : 259000 lm
Luminaire wattage : 1505.9 W
Measurement code : LVM2047600

Note: Luminaire data not from database.



5. Installation Data

5.1 Legends

Project Luminaires:

Code	Qty	Luminaire Type	Lamp Type	Flux (lm)
D	6	BVP518 OUT T35 A35-NB LO	1 * LED1720-4S/740	1 * 172000
F	4	BVP528 OUT T35 A35-NB LO	1 * LED2590-4S/740	1 * 259000
G	4	BVP528 OUT T35 A35-NB LTM	1 * LED2590-4S/740	1 * 259000

Switching Modes:

Code	Switching Mode
1	200lux Switching
2	120 Lux Switching
3	Spillage Switching

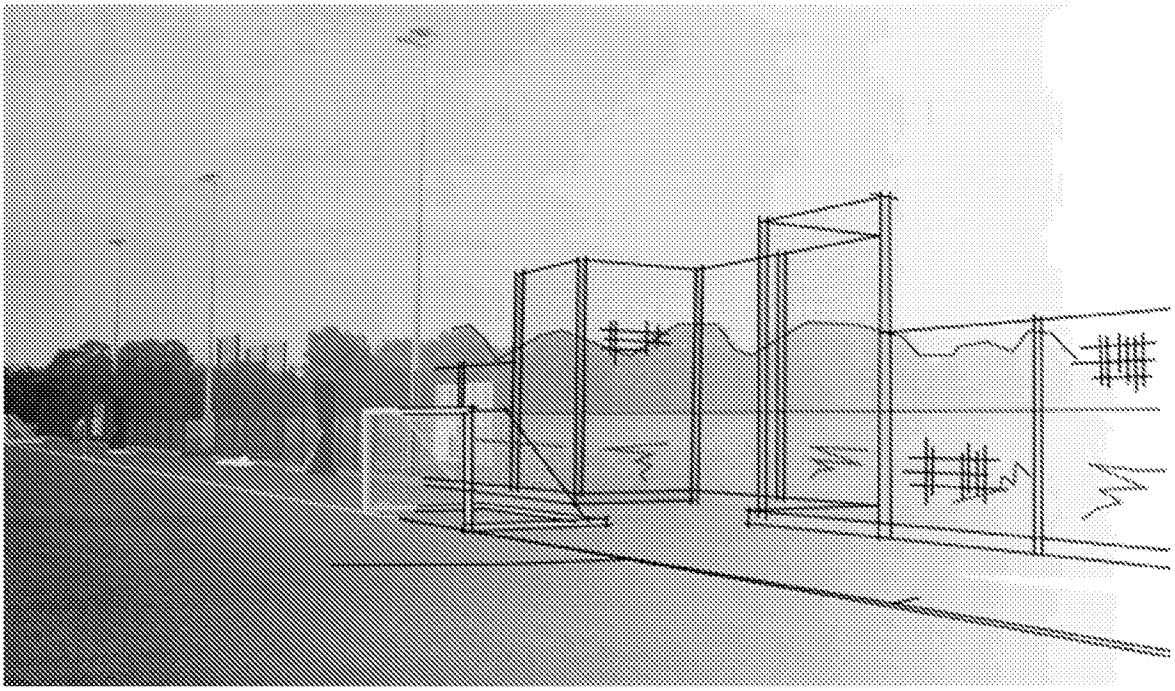
5.2 Luminaire Positioning and Orientation

Qty and Code	Position			Aiming Angles			Switching Modes		
	X (m)	Y (m)	Z (m)	Rot.	Tilt90	Tilt0	1	2	3
1 * F	-47.50	-36.00	15.00	77.0	70.0	0.0	+	+	+
1 * G	-47.50	-36.00	15.00	43.0	70.0	0.0	+	+	+
1 * F	-47.50	36.00	15.00	-77.0	70.0	-0.0	+	+	+
1 * G	-47.50	36.00	15.00	-43.0	70.0	-0.0	+	+	+
1 * D	-1.50	-36.00	15.00	53.1	68.0	0.0	+	+	+
1 * D	-1.50	-36.00	15.00	90.0	70.0	0.0	+	+	+
1 * D	-1.50	-36.00	15.00	126.9	68.0	0.0	+	+	+
1 * D	1.50	36.00	15.00	-127.0	68.0	0.0	+	+	+
1 * D	1.50	36.00	15.00	-90.0	70.0	0.0	+	+	+
1 * D	1.50	36.00	15.00	-53.0	68.0	0.0	+	+	+
1 * F	47.50	-36.00	15.00	103.0	70.0	-0.0	+	+	+
1 * G	47.50	-36.00	15.00	137.0	70.0	-0.0	+	+	+
1 * F	47.50	36.00	15.00	-103.0	70.0	0.0	+	+	+
1 * G	47.50	36.00	15.00	-137.0	70.0	0.0	+	+	+

Palmer Road Sports Complex, Arun

Creation of a full size 3G Artificial Grass Pitch (AGP), Multi Use Games Area (MUGA), play area and natural turf sports pitches.

Sports Lighting Statement



Site	Palmer Road Sports Complex, Arun		
Project	Creation of a full size 3G Artificial Grass Pitch (AGP), Multi Use Games Area (MUGA), play area and natural turf sports pitches.		
SSL project code	SSL3355		
Associated Documents	Appendix A – Floodlighting Performance Report SS3355 Technical Information to Support Planning SSL3355 03 – Floodlighting Scheme		
Document title	Sports Lighting Impact Statement		
Document control	**Revision**	**By**	**Date**
	1st issue	WB	01/11/24

Surfacing Standards Limited,
Office 3, Empingham House, Empingham Gate, Ayston Road, Uppingham, Rutland, LE15 9RT

T: 01536 400812
E: info@surfacingstandards.co.uk

www.surfacingstandards.co.uk

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Surfacing Standards Limited,
Office 3, Impington House, Impington Gate, Ayston Road, Uppingham, Rutland, LE15 9GY

T. 01572 820912
E. info@surfacingstandards.co.uk

www.surfacingstandards.co.uk

Sports Lighting Assessment

1. Sports Lighting Proposal

The proposed Artificial Grass Pitch (AGP) require a sports lighting system to satisfy the necessary and planned usage. The lighting system is vital to ensure that clubs and local community are able to make use of the facility during the darker winter months, to ensure that training sessions and matches can be safely accommodated.

The proposed sports lighting system will be operated during evenings of permitted use, after dusk and up to the approved curfew hour.

The following hours are proposed for usage of the new AGP.

Monday to Friday: 09:00 to 21:30 hours
Saturday & Sunday: 09:00 to 17:00 hours

The sports lighting hours of usage would be required during these times, but only at the times of the year when daylight is fading or it has gone dark.

The permitted hours of use will be determined through the planning application process and the applicant wishes to accommodate hours of use in order to maximise developmental outcomes; both during the day and during evenings and at weekends for the local clubs or via pre-arranged and structured community access.

The sports lighting proposal includes the following details shown in Table 1:

Table 1 – Lighting system detail

Requirement	Detail provided
The precise location of the pitch, which should take account of the light spill given its proximity to, for example, any highway and any nearby residential properties.	Please refer to 'Appendix A - Floodlighting Performance Report'. Light spillage does not impact on any local residential properties or highways.
The types of sport to be played on the pitch and the standard of play - both of which will have an influence on the amount of illumination required.	The standard of football activities includes FA affiliated junior / youth football (highest level of competition).
Details of columns – number, height and finish.	The proposed floodlighting system comprises of 6Nr. 16m high steel masts, all finished galvanised (Z275) self-coloured. 16m high masts are tapered with a 346mm diameter shaft at the base and 102mm diameter shaft to the column top.
Details of luminaires – number, types, dimensions, finish and output of lamps fitted, to include manufacturer's technical information.	Philips Optivision LED gen3.5 luminaires to the AGP. The luminaires, manfuactured by Philips Lighting, have been selected as they provide a complete lighting system even for the most complex of areas. They are a high efficiency luminaire with low energy consumption and meet the highest performance standards providing outstanding uniformity. They are also dimmable which provides reduced level lighting options when each pitch is only being used for training purposes. The design of the luminaire allows for a slimine fitting, much less obtrusive than other fittings.
Details of any cowls/hoods/shades/baffles that maybe needed to control light spill and glare – number, dimensions and finish.	The specific type of luminaire proposed has a zero upward light ratio. The spill limiting technology provided by the Philips Optivision LED gen3.5 luminaire which ensures that we can achieve the controlled spillage levels indicated on the lighting scheme design submitted as part of this application. The lighting system design will comply with recommendations published within ILP Guidance Notes for the Reduction of Obtrusive Light 2021 (Appendix B). On completion of the installation, the system will be tested and commissioned to ensure the LUX levels submitted as part of this application are achieved and not exceeded.
Plan showing the pitch with the location/position of lighting columns and luminaires.	Refer to drawing 'SSL3355 03 – Floodlighting Scheme', and 'Appendix A - Floodlighting Performance Report', showing results of horizontal and illuminance over the performance areas and spillage exceeding the facility perimeters at ground level and 3m above ground.
Details of lighting set up – horizontal (rotation) and vertical (tilt) alignment of the luminaires	Refer to 'Appendix A - Floodlighting Performance Report'.
Details of lighting output, including levels of surface luminance on the pitch and overspill, i.e. off the pitch (manufacturers/supplier's calculations and	Refer to drawing 'SSL3355 03 – Floodlighting Scheme' and 'Appendix A - Floodlighting Performance Report'.

Surfacing Standards Limited,
Office 2, Kingsbury House, Uppingham Gate, Ayston Road, Uppingham, Rutland, LE15 9RT

T: 01572 820912
E: info@surfacingstandards.co.uk

www.surfacingstandards.co.uk

diagrams should be provided separately and also to be overlaid on an OS base so that the impact on the surrounding area can be assessed).	

In designing a suitable floodlighting solution for the proposed development, several key specification issues had to be considered. These included the illuminance (Lux) level required, the environmental zone category for the site, the minimum mast height, the number and type of floodlights.

The task of designing the optimum floodlighting and external lighting design was undertaken using specialist design software (CalcuLuX Area 7.9.0.0) provided by Philips Lighting.

The details of how site issues were resolved are as follows:

2. Design Principal

A new lighting system should provide the following lighting standards, in accordance with The Football Association (FA) (FIFA Class II) lighting requirements for varying types of play as shown in table 2.

Table 2 – Sporting lighting level requirements

Class of Play	Maintained average illuminance	Uniformity (Min / Ave)
Competition	>200 Lux	>0.6
Cross Play	>120 Lux	>0.6
Training	>120 Lux	No Requirement

The floodlight system has been designed in such a way to allow each half of the AGP to be individually programmed to facilitate economical management and prevent over lighting to areas of the pitch when not in use.

(Lux level is the intensity of light as measured on a given surface considering the area over which the luminous flux is spread. For example, 1000 lumens which is the output of a given light source concentrated into an area of one square metre, would illuminate that square metre to 1000 Lux. If spread over an area of ten square metres, the same 1000 lumens light source would produce a dimmer illuminance of only 100Lux.)

In addition, the lighting system design seeks to comply with complimentary recommendations published within BS EN 12193:2007 Light and lighting. Sports lighting.

BS EN 12193 is the European standard that deals with sports lighting to ensure good visual conditions for players, athletes, referees, spectators and CTV transmission. Its objective is to provide recommendations and specify requirements for good quality sports lighting by:

- Optimising the perception of visual information used during sports events
- Maintaining the level of visual performance
- Providing acceptable visual comfort
- Restricting obtrusive light

BS EN 12193 specifies lighting for indoor and outdoor sports events most practiced in Europe. It provides lighting values for the design and control of sports lighting installations in terms of illuminances, uniformity, glare restriction and colour properties of the light sources.

All the above requirements are meant to be as minimum requirements. It also gives methods by which these values are measured. For the limitation of glare, it also points out restrictions on the location of the luminaires for specific sporting activities.

Selection criteria of chosen design:

- Adequate illuminance levels (as per above requirements)
- Good uniformity (as per above requirements)
- Low light pollution (displayed within design)
- Good aesthetic appearance (unistreet product is developed and used within most councils for street lighting around the UK)
- Regular maintenance
- Vandal resistant equipment and materials

3. Environmental Status

The environmental category was established by referring to The Institution of Lighting Professionals (ILP): Guidance Notes for The Reduction of Obtrusive Light GN01/21 (as included in 'Appendix B – ILP Guidance Notes'). This document categorises the environment into five zones ranging from E0 (Protected) to E4 (Urban).

This site has been classified as an E3 Zone (well inhabited rural and urban settlements). The E3 zone has been highlighted in Table 3 below, which has been taken from Appendix B.

Table 3 – Environmental Zones

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

4. Floodlight Design

To meet the requirements of The Institution of Lighting Professionals: Guidance Notes for The Reduction of Obtrusive Light GN01:2021, the floodlighting system chosen uses a flat glass technology.

The products and system have been chosen specifically to mitigate spillage of lighting to the surrounding area and the houses to the north, east and south whilst still maintaining an average of 200 lux across the pitch.

The solution has been designed to provide lighting specifically for the external sports facilities, which may be controlled accordingly to endeavour to reduce energy consumption and potential impact on the surrounding environment.

The LED gen3.5 luminaires, manufactured by Philips Lighting, have been selected as they provide a complete lighting system even for the most complex of areas. They are a high efficiency luminaire with low energy consumption and meet the highest performance standards providing outstanding uniformity. They enable highly precise light distribution with minimum spill light. They are also dimmable which provides reduced level lighting options when each pitch is only be used for training purposes. The design of the luminaire allows for a slimine fitting, much less obtrusive than other fittings.

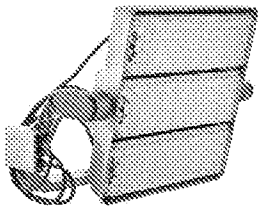

Figure 1 – Example LED

5. Mast Design

The mast height was calculated using the method detailed in the CIBSE guide LG4 "Sports Lighting".

This uses angles projected from the centre of the pitch and the touchlines to produce a head frame location zone.

When applied to this project the optimum mast height ranged from 12m to 18m.

A 15m mounting height was chosen for the new Artificial Grass Pitch (AGP), as this will allow the optimal downward light angle whilst minimising spillage to the surrounding area.

These masts heights will result in very low vertical overspill and good uniformity on the playing surface to ensure that the artificial lighting:

- Is directed fully downwards towards the playing pitch surface;
- Avoids sky glow;
- Achieves full cut-off as recommended by The British Astronomical Association's Campaign for Dark Skies.

By contrast, higher columns would require more intensive lighting needed to provide adequate results at ground level and lower column heights would result in a higher aiming angle for every luminaire, resulting in increased overspill and glare.

On this basis, 15m high mounting heights provide the most efficient solution and the proposed masts will offer a slim-line profile, which will minimise daytime impact.

Figure 2 – Examples of 15m high slimline floodlighting column with LEDs (proposal is for 16m)

6. Floodlighting Performance

The lighting proposal is detailed within 'Appendix A - Floodlighting Performance Report', which shows the mast locations, floodlight orientations, luminance levels on the pitch and projected overspill values.

The design for the Artificial Grass Pitch (AGP) achieves values which meets the requirements of BS EN 12193 as shown in table 4 (found on page 5 of 'Appendix A – Floodlighting Performance Report'.

Table 4 – Illuminance Calculations

Calculation	Switching Mode	Type	Unit	Ave	Min/Ave	Min/Max
Football 200 Lux	1	Surface Illuminance	lux	249	0.60	0.41
Football 120 Lux	2	Surface Illuminance	lux	131	0.60	0.41
North Cross Pitch	5	Surface Illuminance	lux	239	0.60	0.47
South Cross Pitch	6	Surface Illuminance	lux	239	0.60	0.47

All design calculations have been undertaken using an open, unobstructed site, thereby creating a worst case scenario.

Design values of overspill will be further reduced by existing mature trees, adjacent buildings, or natural screening.

The maintained luminance values for the 200lux lighting (highest lux level) has been calculated using a maintenance factor of 0.9 to account for environmental conditions and depreciation of light output between cyclical maintenance, including bulk lamp change.

The football pitch can be switched to a lower level of lighting for community usage and training.

7. Obtrusive Light Calculation

Obtrusive light has been calculated for 7 of the residential households to the north, east and south of the proposed AGP.

'Observers' have been placed on seven residential properties spaced along the north, east and south rows of the closest residential buildings, due to their proximity to the proposed floodlights. For each of the houses, two observers have been placed at the closest part of building and one at the closest part of the garden. The

observers have been set to 1.8m and 3.6m high by the building to replicate the height of the average person standing up on the ground floor and the first floor and 1.8m to the garden to replicate the height of the average person standing up outside.

All calculations have been made without consideration of any obstructions including treelines, hedges, fences or the acoustic fence.

Details of the exact observer locations can be found in 'Appendix A – Floodlight Performance Report' on page 4.

The ILP (Appendix B) provides guidance on the maximum values for the luminous intensity of luminaires in designated directions where views of bright surfaces of luminaires are likely to be a nuisance to occupants of premises, or from positions where such views are likely to be maintained. The luminous intensity values for an E3 zone have been highlighted in Table 5 below. The column highlighted is the apparent surface of the light source seen from the observer position. Therefore, for an E3 zone the pre-curfew light intensity seen by an observer can reach up to 10,000 candelas.

Table 5 – Limits for the luminous intensity of bright luminaires

Light technical parameter	Application conditions	Luminaire group (projected area A_p in m²)					
		$0<A_p \leq 0.002$	$0.002<A_p \leq 0.01$	$0.01<A_p \leq 0.03$	$0.03<A_p \leq 0.13$	$0.13<A_p \leq 0.50$	$A_p > 0.5$
Maximum luminous intensity emitted by luminaire (I in cd)[1]	E0 Pre-curfew Post-curfew	0 0	0 0	0 0	0 0	0 0	0 0
	E1 Pre-curfew Post-curfew	0.29 d^2 0	0.63 d^2 0	1.3 d^2 0	2.5 d^2 0	5.1 d^2 0	2,500 0
	E2 Pre-curfew Post-curfew	0.57 d^2 0.29 d^2	1.3 d^2 0.63 d^2	2.5 d^2 1.3 d^2	5.0 d^2 2.5 d^2	10 d^2 5.1 d^2	7,500 500
	E3 Pre-curfew Post-curfew	0.86 d^2 0.29 d^2	1.9 d^2 0.63 d^2	3.8 d^2 1.3 d^2	7.5 d^2 2.5 d^2	15 d^2 5.1 d^2	10,000 1,000
	E4 Pre-curfew Post-curfew	1.4 d^2 0.29 d^2	3.1 d^2 0.63 d^2	6.3 d^2 1.3 d^2	13 d^2 2.5 d^2	26 d^2 5.1 d^2	25,000 2,500

Table 6 is taken from 'Appendix A – Floodlighting Performance Report' which shows the maximum intensity of light for each observer at the nearest properties and their respective garden, with no interference (e.g. trees, fences walls etc.) thereby providing a worst case scenario. Please note the luminaire code, position and aiming angles columns relate to the light source and not the observer positions.

Table 6 – Obtrusive Light Calculations

Obtrusive Light Calculations:

Switching Mode	Observer Code	Luminaire Code	Position			Aiming Angles			Maximum Intensity (cd)
			X (m)	Y (m)	Z (m)	Rot	Tilt90	Tilt0	
3	Aa	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1202
3	Bb	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1253
3	Cc	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1390
3	Dd	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1289
3	Ee	G	47.50	36.00	15.00	-137.00	70.00	0.00	1425
3	Ff	G	47.50	36.00	15.00	-137.00	70.00	0.00	1300
3	Gg	G	47.50	36.00	15.00	-137.00	70.00	0.00	1337
3	Hh	G	47.50	36.00	15.00	-137.00	70.00	0.00	1332
3	Ii	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1007
3	Jj	G	47.50	-36.00	15.00	137.00	70.00	-0.00	1055
3	Kk	G	47.50	36.00	15.00	-137.00	70.00	0.00	1012
3	Ll	G	47.50	36.00	15.00	-137.00	70.00	0.00	1063
3	Mm	G	47.50	36.00	15.00	-137.00	70.00	0.00	1043
3	Nn	G	47.50	36.00	15.00	-137.00	70.00	0.00	1102

Surfacing Standards Limited,
Office 3, Empingham House, Empingham Gate, Ayston Road, Uppingham, Rutland, LE15 9RT

T: 01572 820912
E: info@surfacingstandards.co.uk

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The highest maximum intensity for the proposed lighting is 1,425 candelas, which is below the pre-curfew luminous intensity of the 10,000 candela threshold for a development within environmental zone E3, and also below the pre-curfew luminous intensity for an E2 zone of 7,500 candelas.

All floodlights will be extinguished at the permitted curfew time and therefore, luminaire intensity will be 0 candela which is accords with the post-curfew 1,000 candela threshold for the environmental zone E3.

8. Lighting Intrusion

Highlighted in Table 7 below is the illuminance levels for an E3 zone for both pre and post-curfew which are 10 lux and 2 lux respectively.

Table 7 – Maximum values of vertical illuminance on premises

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E_v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

Figure 3 below shows the spillage for the proposed lighting for the AGP. Please note that anything in blue is less than 1 lux

Figure 3 – Spillage for the proposed AGP (Lux)

Surfacing Standards Limited,
Office 2, Impingham House, Impingham Gate, Ayston Road, Uppingham, Rutland, LE15 9FZ

T. 01572 820812
E. info@surfacingstandards.co.uk

www.surfacingstandards.co.uk

The lighting intrusion to the nearest property is less than 1 lux (blue) at ground level. Therefore, the proposed lighting design would meet the pre-curfew and post curfew thresholds for a development of 10 lux within environmental zone E3.

During curfew hours the lighting light intrusion will be <1 Lux which accords with the curfew 10 Lux threshold for a development within environmental zone E3.

All floodlights will be extinguished at the permitted curfew time and therefore, light intrusion will be 0 Lux which is accords with the post-curfew 2 Lux threshold for a development within environmental zone E3.

9. Planning Policy Context

Central Government guidance on lighting and planning is contained in the National Planning Policy Framework (NPPF) which came into force in 2023.

The NPPF defines Sustainable Development, which is the core principle of planning, setting out that there are three dimensions to sustainable development: economic, social, and environmental.

Part of the environmental dimension of sustainable development is clearly stated to include contributing to protecting and enhancing our natural, built, and historic environment; and, as part of this, helping to minimise pollution.

Pollution is defined within the NPPF as including: "Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light."

Perhaps most importantly about light pollution, the NPPF also states that "By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".

Obtrusive light was made a Statutory Nuisance under the Clean Neighbourhoods and Environment Act 2005. The Council can take action against sources of intrusive light where these are shown to be causing a nuisance, for example a domestic floodlight shining into window in a neighbouring dwelling. In addition, conditions imposed on any planning consent for lighting must ensure that adequate control can be enforced. It is acknowledged that many lighting installations which may cause obtrusive light do not require planning permission or do not fall under the Act as a statutory nuisance.

10. Floodlight Impact on Development

The maintained illuminance values are calculated using a maintenance factor of 0.90. This takes into account light losses due to dirt accumulation on the floodlight front glass and lamp lumen depreciation, ensuring that the minimum requirements for safe play are achieved.

Within the design calculations, the use of the model is based on the land being flat and has not taken into account the topographical survey, or any blockages that could have an impact on the lighting plan.

The results provided are the worst case in design format.

11. Mitigation Measures

Obtrusive Light and Mitigation Measures

Obtrusive light, whether keeping someone awake through a bedroom window or impeding the view of the skyline, is a form of pollution. Obtrusive light can be substantially reduced without detriment to the lighting task. The design included for in this proposal represents a significant advancement on older type pitch floodlighting systems and ensure obtrusive light is significantly reduced in terms of;

- Proposed design does not "over" light. This is a major cause of obtrusive light and is a waste of energy. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light.
- Design ensures that floodlighting switch off lights when the pitch is not in use. LED lamps do not have a cool down period and so the football pitch will be 'dark' immediately after the pitch floodlighting system is switched off.
- Proposed design uses specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. Luminaries have been selected to reduce spill light and glare to a minimum.
- Consideration also has to be given to the issue of glare. The asymmetric distribution of the floodlights allows for a lower tilt angle from the horizontal, hiding the lamp and therefore reducing glare not only to players and spectators but also to any surrounding residents, motorists and wildlife. The maximum tilt angle for any floodlighting will be no more than seven degrees from the horizontal plane.
- Limitation of the lighting impact will be controlled by the strict management of permitted operating times. An intelligent control system shall be in place that allows pre programmable switching of the lights for each allocated time slot to ensure lights are extinguished at the curfew hour every night of use.

The intelligent control system will be set to operate within a pre-programmed time including a seasonal changeover facility for BST and GMT.

12. Ecological Factors Considered

When creating a lighting design it is important that ecological factors are considered within the lighting design.

As an industry standard, LED lighting colour temperature is generally accepted as 5,700 kelvin as it provides a good representation of the colour temperature during the daylight hours and provides a better and safer user experience for sports. The lighting design proposed utilises 4,000 kelvin LEDs, a warmer white, to reduce the coolness of the lights whilst still providing an acceptable and safe colour temperature for an outdoor sporting application.

The lighting design also attempts to not 'over light' the football pitch. The lighting design has been produced to meet the minimum requirements of 200 lux for FA competitive lighting, as outlined above, without exceeding the requirements and over lighting the football pitch.

The lighting design utilises a maximum tilt of 70° so as to not contribute to sky glow, as represented in Figure 5 taken from Appendix B – ILP Guidance Notes. This is confirmed in Appendix A – Floodlighting Performance Report on page 6 which states the Upward Light Ratio (ULR) for each switching mode is 0.00 (of which an E3 zone should be less than 5%).

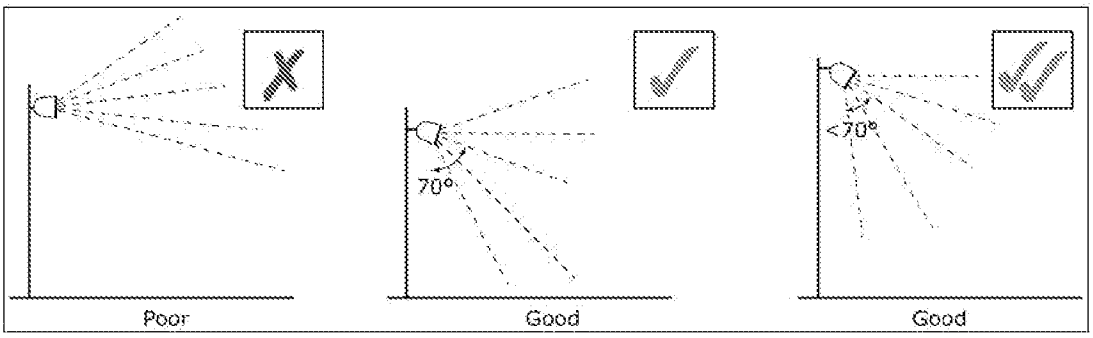

Figure 5 – Light angle tilt to not contribute to sky glow

Spillage has been restricted to the northern tree canopy line such that spillage is 2 lux or less to reduce the ecological impact.

13. Monitoring Programme

On completion of the floodlighting installation, the system will be tested and commissioned to ensure the agreed design levels are achieved and not exceeded. During the operational life cycle of the system, periodic lighting checks and assessments will be undertaken to ensure the installation continues to satisfy the requirements set out in the lighting design.

These assessments include:

- Lighting Levels to each individual area
- Overspill levels

14. Robustness of Analysis

Within the design calculations, the use of the model is based on the land being flat and has not taken into account the topographical survey, or any blockages that could have an impact on the lighting plan.

As such the results provided are the 'worst case' in design format.

15. Lighting Assessment Conclusion

1. The proposed floodlighting system is specifically designed to fulfil sports lighting requirements and is particularly suited to applications where low light pollution is essential.

2. Performance of the proposed artificial lighting (floodlighting) systems satisfies the intended sporting applications and standards of play.

3. A 15m high mounting height to the Artificial Grass Pitch (AGP) provides the most efficient solution and the proposed masts will offer a slim-line profile, which will minimise daytime impact.

4. The proposed LED system is a down lighting luminaire that will provide the optimum sports lighting solution, ensuring that light reaches the sports surface and not into the sky or polluting the environment.

5. Performance of the proposed artificial lighting (floodlighting) system complies with an Environmental Zone E3 (ILP).

6. Light intrusion to the closest residential properties whilst floodlights are operated is comfortably below the threshold for an E3 environmental zone and as such, does not create an unacceptable impact by way of artificial lighting.

Surfacing Standards Limited,
Office 2, Kingsbury House, Uppingham Gate, Ayston Road, Uppingham, Rutland, LE15 9RT

T. 01572 820912
E. info@surfacingstandards.co.uk

www.surfacingstandards.co.uk

7. Luminaire intensity created whilst floodlights are operated is below the threshold for the Environmental Zone E3 location and as such; does not create an unacceptable impact by way of artificial lighting.

8. All luminaires have a zero upward light ration to limit overspill and the proposed vertical alignment of luminaires is 2° maximum above the horizontal plane

9. Upward waste light will also be minimized, achieving full cut-off with 0% projected into the atmosphere. This satisfies the recommendations by The British Astronomical Association's Campaign for Dark Skies, an organisation who lobby for low light pollution lighting systems.

10. Use of the artificial (flood) lighting system within permitted times will be controlled by a photocell detector and timer switch to ensure that any lighting does not adversely impact neighbouring residential amenity.

11. Control switches and time clocks shall be installed to the floodlights to ensure they do not remain on any later than the permitted curfew hour and therefore mitigate impact to the surrounding environment.

12. Time clocks will be set to operate within a pre-programmed time including a seasonal changeover facility for BST and GMT.

The lighting scheme has been designed to minimise the impacts on surrounding areas outside of the Artificial Grass Pitch (AGP), and given the proposed location of the AGP within the site footprint, we do not consider that the proposed lighting would result an unacceptable impact by way of artificial lighting on residential amenity or the surrounding landscape.

End of document

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Surfacing Standards Limited,
Office 2, Kingsgham House, Uppingham Gate, Ayston Road, Uppingham, Rutland, LE15 9RT

T. 01572 309512
E. info@surfacingstandards.co.uk

www.surfacingstandards.co.uk