



Lighting Assessment to APH Airport Parking

Prepared for APH Airport Parking

05/09/2023

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Document Origin

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1.0 Introduction

1.1 Background

Clancy Consulting Limited has been instructed by Atelier MB Ltd on behalf of APH Airport Parking to carry out a lighting assessment to support the planning application for a new multi-storey airport parking facility for APH Airport Parking for Manchester Airport. The new multi-storey car park is to replace an existing building on the site.

A site location plan is presented below and is located at:

APH Airport Parking
Bradnor Road
Sharston
M22 4TE

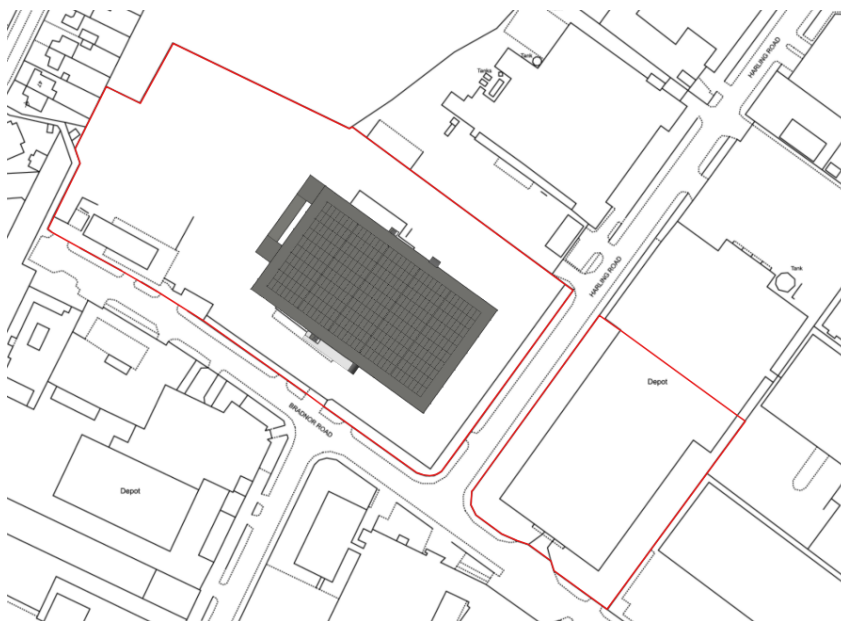


Figure 1 - Site Location Plan

The site currently comprises of the existing carpark facility which is to be demolished and a new 4 story car storage facility to serve Manchester Airport off site parking with a minimum capacity of 1400 spaces.

1.2 Objectives

The objective of this assessment is to To undertake lighting assessment of the new multi-storey car park airport parking facility to support the planning application to include:

- To demonstrate the nature and location of the external lighting, showing potential impacts and glare. This assessment is to accompany the discharge of planning requirements in the aforementioned site.
- Production of an outline lighting layout based on proposed plans contained in the planning pack as received on the 20th July '23
- Selected lighting calculation illumination planes
- Typical Luminaire Selection

- Summary report reflecting the recommendations of:
 - ILP Guidance Note 01/2021 - Guidance notes for the reduction of obtrusive light
 - SLL LG 6: The exterior environment
 - SLL Code for Lighting

1.3 Basis of Assessment

Light Pollution

It impedes your view of the night sky and is a form of pollution. The pollution can be substantially reduced without detriment to the lighting task by appropriate design. However, there is no existing guidance that is comprehensive, relevant, and accessible, and the topic is a complex one both procedurally and technically.

Sky Glow

The brightening of the night sky above towns and cities, comprising of glare, the uncomfortable brightness of a light source when viewed against a dark background and “Light Trespass”, the spilling of light beyond the boundary of the property on which the light source is located, are all forms of obtrusive light. “Upward Light Ratio” (ULR), the amount of light (flux) emitted above the horizontal when the luminaire is mounted in its installed position. ULR ignores the reflective properties of the surfaces on which the light falls, and ignores the characteristics of the luminaire and considers only the reflective upward flux for each luminaire.

What Causes Light Pollution?

The major sources of artificial light include street lighting, security lamps, advertising and display lighting, floodlights for sporting events and building illumination. Poorly fitted lights allow light to shine upwards, which causes sky glow. Some artificial light is also reflected upwards from roads, pavements and buildings.

What Are the Effects of Light Pollution?

Light pollution impacts in various ways on the surrounding area.
It can:

- Cause migrating birds to collide with illuminated buildings
- Create unnecessary and ill directed light and is a waste of energy
- Cause a false dawn that can disrupt animal and bird behaviour
- Light pollution intrudes upon the landscape and compromises the aesthetic value of architectural and natural landscape
- Cause moth deaths as they are attracted to the light (possibly a factor in the recent decline in urban moth populations)
- Bright lights can cause human sleep disturbance, whilst unsuitable lighting can increase risks for drivers and pedestrians
- Astronomical observation or simple enjoyment of the night sky is largely impeded.

Reduction Methods to Reduce Light Pollution.

Uncontrolled artificial light can be a nuisance; however, artificial light is needed to safeguard and enhance our night-time environment.

The effects of light pollution can be mitigated with a number of simple measures:

- The use of luminaires that reduce / omit direct light emitted upwards.
- Positioning lighting properly and directing it downwards to the required target area.
- Using only the necessary amount of lighting.
- Switching off unnecessary lighting, particularly decorative floodlighting, and advertising lighting, late at night and in the early morning.

Environment Zones

The initial proposals are based upon the agreed zones in ILP Guidance for the Reduction of Obtrusive Light GN01:2021, the following environmental zones for exterior lighting control are recognised as accepted standards - See table 1 below.

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

(Table 1 - above is an extract from Guidance Notes for the Reduction of Obtrusive Light GN01:2021)

From review of the proposed site and surrounding context – given the proximity of industrial units, retail and commercial premises, this would tend to categorise the area as an Urban surrounding with a Zone E4 classification i.e. High district brightness, Town / City centres with high levels of night time activity.

Recommended Maximum Values of Light Parameters for the Control of Obtrusive Light

Limitation of illumination on surrounding 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

(Table 2 - above is an extract from Guidance Notes for the Reduction of Obtrusive Light GN01:2021 for Maximum values of vertical illuminance on premises)

The limits for environmental zone E4 to nearby dwelling / premises and specifically windows are identified as 25lx (pre-curfew) and 5lx (post-curfew).

Limitation of skyglow

Light technical parameter	Environmental zones				
	E0	E1	E2	E3	E4
Upward light ratio (ULR) / %	0	0	2.5	5	15

(Table 3 - above is an extract from Guidance Notes for the Reduction of Obtrusive Light GN01:2021 for Maximum values of upward light ration (ULR) of luminaires)

The limits for environmental zone E4 limiting the upward light ration (ULR) to 15%

2.0 Design Methodology

2.1 Good Practice

As a result of the Basis of Assessment detailed in in section 1 above and the effects caused, there are increasing demands for action to prevent and control lighting impacts; the decision-making process would be managed to define where and how lighting is installed and by improving the overall lighting design, this is defined in section 2 of this report.

The purpose of this design methodology statement is to advise upon how the lighting provision impact can be mitigated through appropriate action by all those involved through the consultation and design process.

Specific objectives are to:

- Identify good practice in the planning and design of lighting and define how this can be achieved and implement this by managing the specification output.
- Under pin the specification output by utilising advice provided in the Chartered Institution of Building Services Engineers (CIBSE), British Standards and the Institution of Lighting Professionals (ILP) in the specification output.

2.2 Initial Scheme Appraisal

Having established that lighting is needed, an initial assessment of the specific lighting requirements of the task in hand has been carried out in order to provide a concept proposal for the purpose of planning permission. The outline lighting scheme has been provided later in this report and provides the following information:

- Lighting Column Locations
- Building Mounted Luminaire Locations
- Lighting Column Heights
- Details of Luminaire Types
- Details of the Sensitive Receptors
- Illumination Level Calculation Plots

The illumination levels proposed for this scheme are detailed below and are in accordance with the Society of Light and Lighting – Lighting Guide 6: The exterior environment and BS EN 12464 Lighting of Workplaces Part 2: Outdoor workplaces and the SLL Code for Lighting.

Application	Minimum maintained mean illuminance (lux)	Illuminance uniformity (minimum/average)
Light traffic and low crime risk car parks	5	0.25
Medium traffic and medium crime risk car parks	10	0.25
Heavy traffic and medium crime risk car parks	20	0.25

(Table 4 - The illumination level is dependent upon the usage level and the crime risk of the location)

Given the location and type of use, the higher risk value has been considered in this assessment and following criteria has been utilised.

- Car Parks
 - Maintained Illuminance (Em) – 20lx
 - Uniformity (Uo) – 0.25

The controls methodology to be employed for this scheme shall provide adaptability and controllability to meet the needs of the planners' requirements, relating to reduction of night-time. Curfew time to be agreed with all stake holders can be readily achieved by the proposals of this report.

This report sets out to prescribe amelioration methods for light pollution. Post this detailed application, a discussion would be held with the local planning officer, this would be to discharge any conditions attached to the planning consent with regard to light pollution.

The principles referred to in this report are those that would be adopted as an integral part of the measures to reduce the light pollution impact and should be read in conjunction with all planning application documentation.

The design methodology would be further developed in conjunction with the design team Architect, incorporating relevant comments to mitigate the effects of light pollution.

Luminaires

The assessment proposals for the external lighting utilises a mixture of column and building / soffit mounted LED luminaires. The full technical specification of the luminaires proposed are detailed below.

Post top luminaires shall be selected for forward throw light distribution, delivered by quality LEDs and UV stabilised optics and LED light engines with 0% Upward Light output Ratio (ULOR) ensuring night-time friendly distribution.

Lighting columns have been selected to balance the required maintained illumination levels and uniformity, whilst minimising the unwanted light spill on the sensitive receptors. Lighting column heights are at 4 metres.

Level 3 and 4 – Open area Lighting Columns (2No Output Options) – Type A

Sirocco Midi area optic

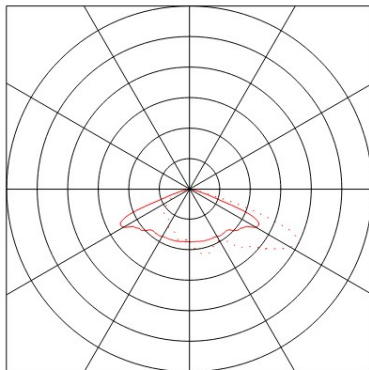
Luminaire data

Luminaire efficiency	: 100%
Luminaire efficacy	: 136.43 lm/W
Classification	: A30 ↓100.0% ↑0.0%
CIE Flux Codes	: 29 64 97 100 100
Glare	: G*3 / D4
Power	: 67 W
Luminous flux	: 9141 lm

Equipped with

Quantity	: 1
Designation	: LED
Colour	: 4000
Luminous flux	: 9141 lm
Colour reproduction	: 70

Dimensions	: 558 mm x 293 mm x 115 mm
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Level 0,1,2 and 3 – Covered Area Luminaires (2No Output Options) – Type B

ACL Industry

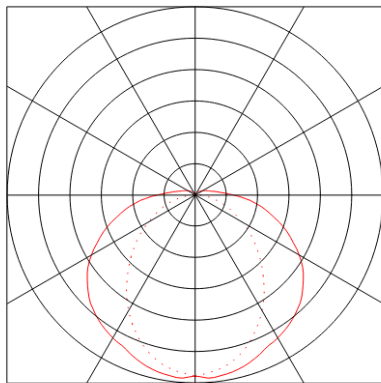
Luminaire data

Luminaire efficiency	: 100%
Luminaire efficacy	: 148.62 lm/W
Classification	: A31 ↓93.6% ↑6.4%
CIE Flux Codes	: 41 71 90 94 100
UGR 4H 8H	: 22.8 / 18.5
Power	: 18.8 W
Luminous flux	: 2794 lm

Equipped with

Quantity	: 1
Designation	: LED
Colour	: 4000k
Luminous flux	: 2794 lm
Colour reproduction	: 1

Dimensions : 1275 mm x 140 mm x 100 mm



Lighting Control

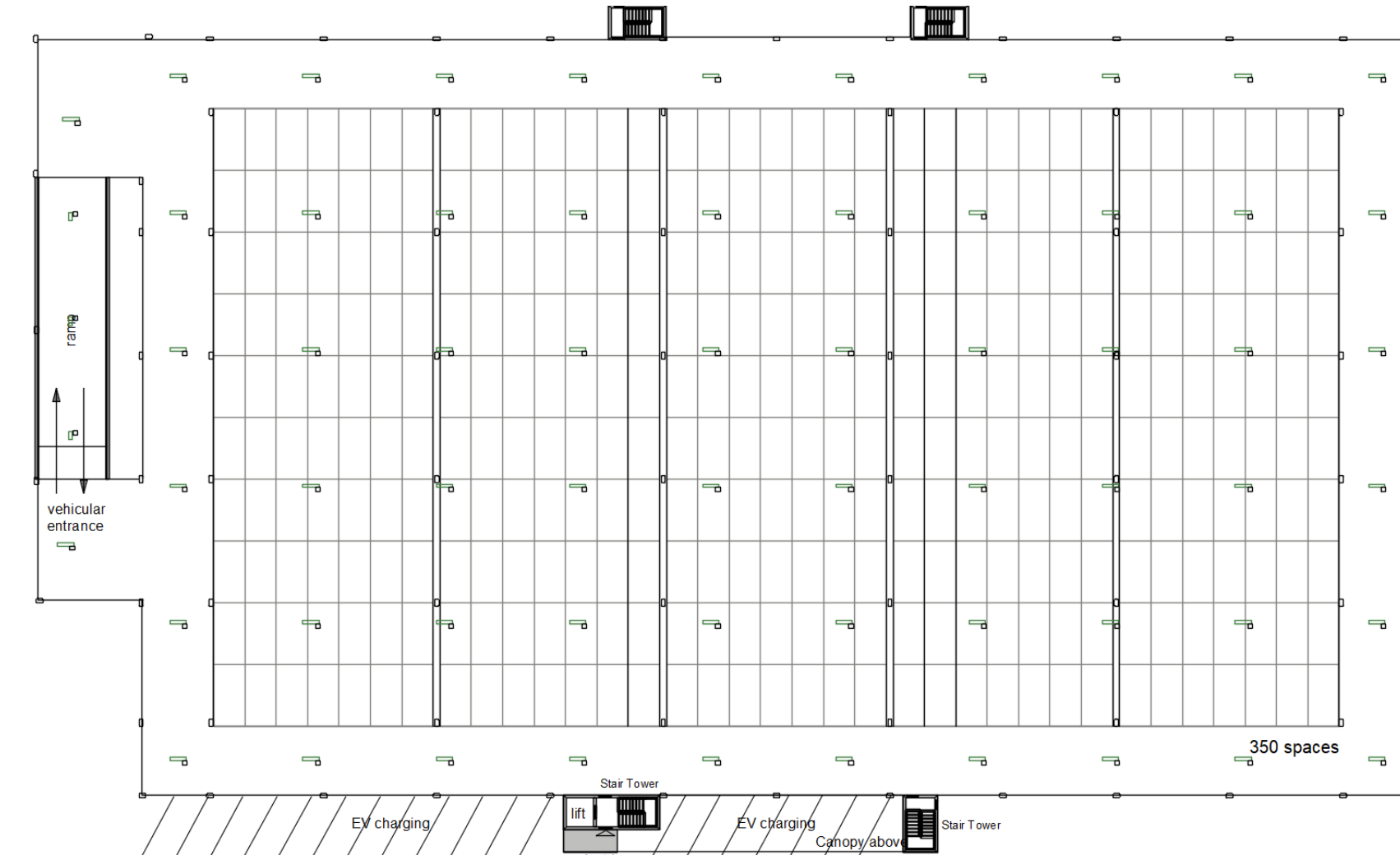
IP66 PIRs are to be installed to provide motion control to lighting columns and soffit mounted luminaires. The PIRs are combined with an integrated photocell and in conjunction with an intelligent driver, can be programmed to enable presence detection and pre set outputs.

- High Mode: When sensor detects motion, dimming control output ramps up to the selected HIGH light level (default is 100%).
- Low Mode: After sensor stops detecting motion and the time delay expires, dimming control output fades down to the selected LOW light level (proposed at 25%).
- Time Delay: The selected time period that must elapse after the last time the sensor detects motion for the electric lights to fade to LOW mode (15 min).
- Cut Off: The time period that must elapse after the lights fade to LOW mode and the sensor detects no motion for the electric lights to turn OFF (1 hour).

Photocell On/Off: When enabled, the sensor will force the luminaire OFF after the light level has exceeded the selected photocell setpoint for at least a minute. It will also force the luminaire ON when the light level goes below the setpoint, even if no motion is detected.

Lighting Column Locations

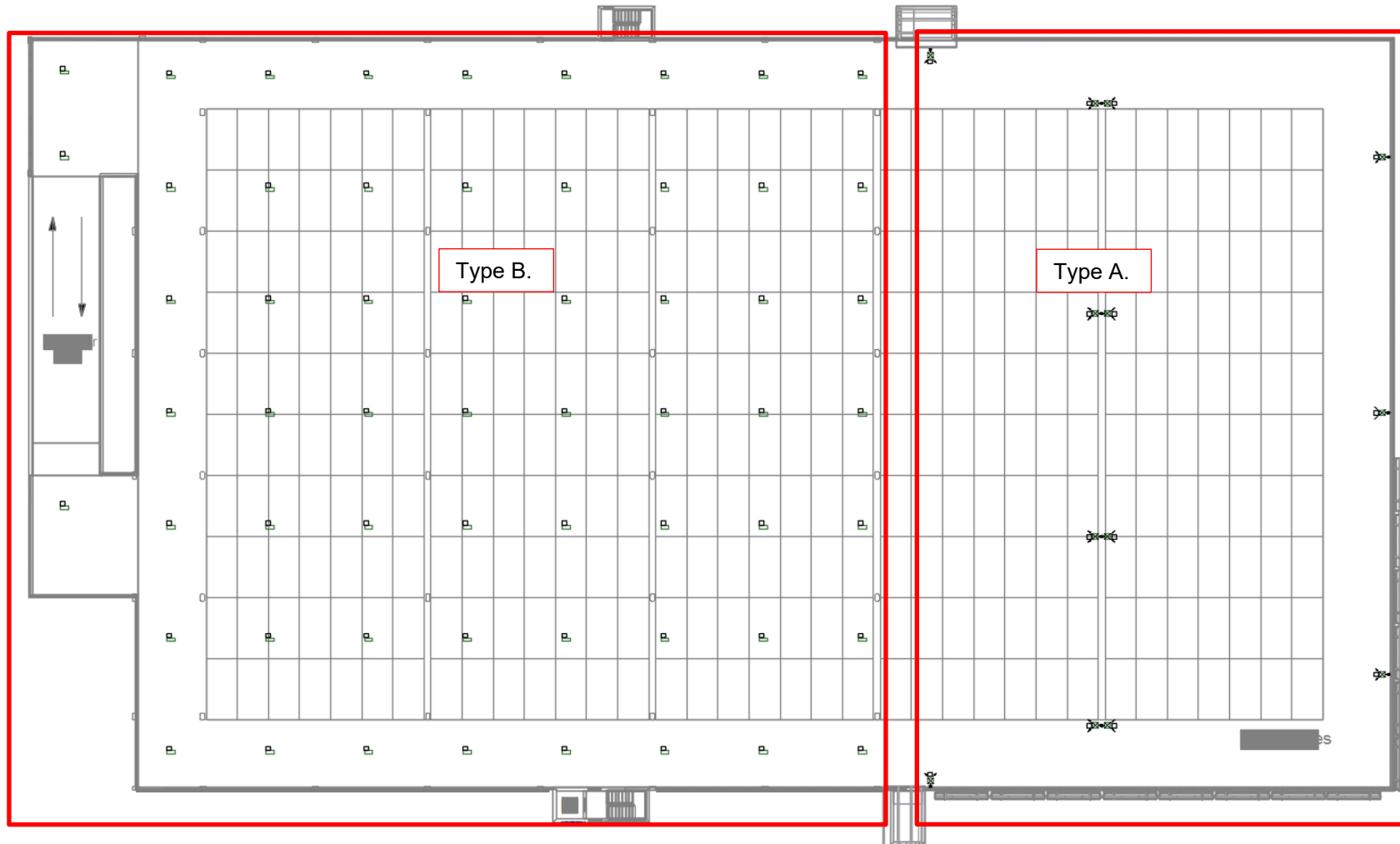
Levels 0, 1, 2 & 3 (Covered)



Type B Luminaire.
Mounted to Soffit

Lighting Column Locations

Level 3



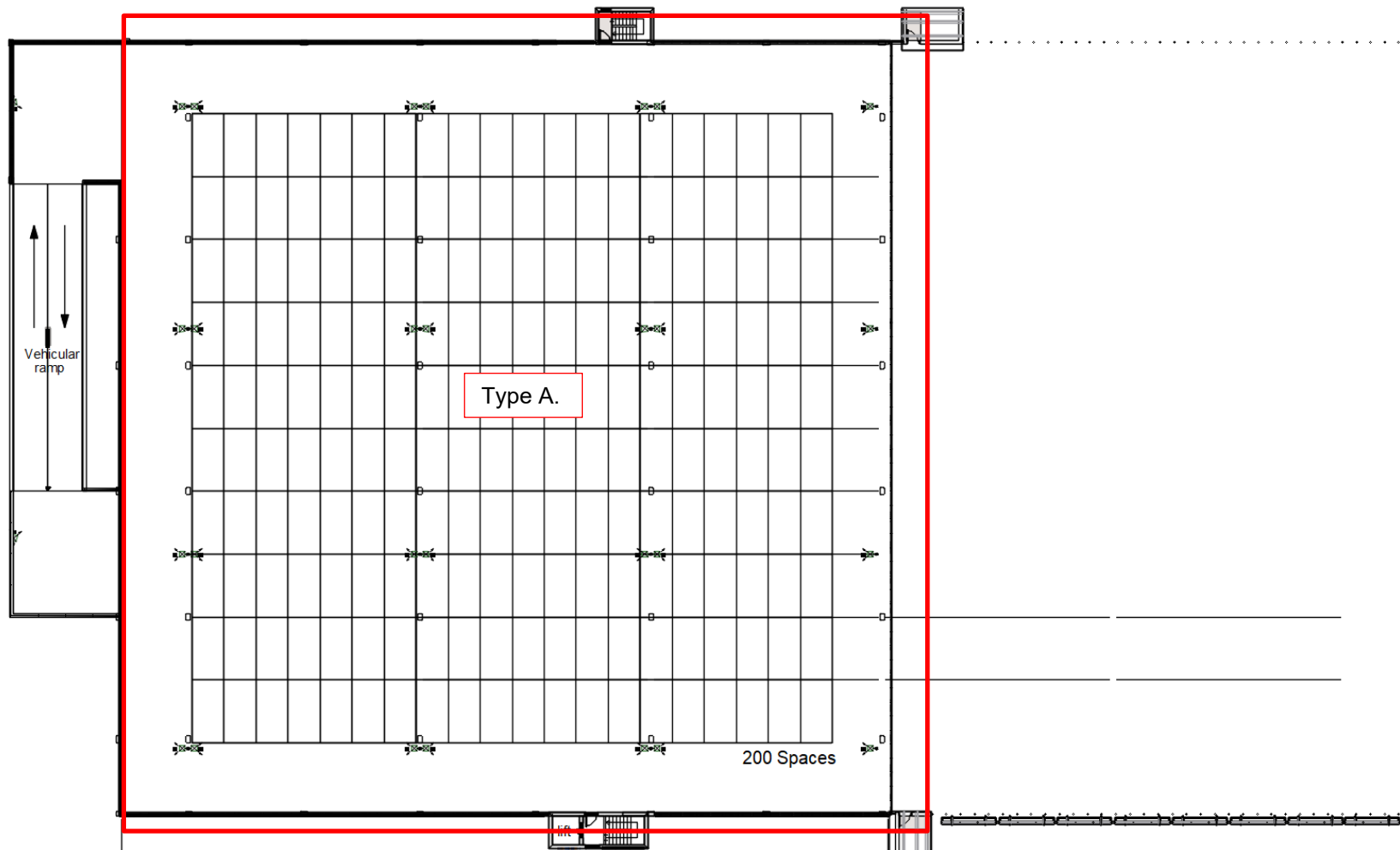
Type A Luminaire.
Post Top on 4M
column.



Type B Luminaire.
Mounted to Soffit

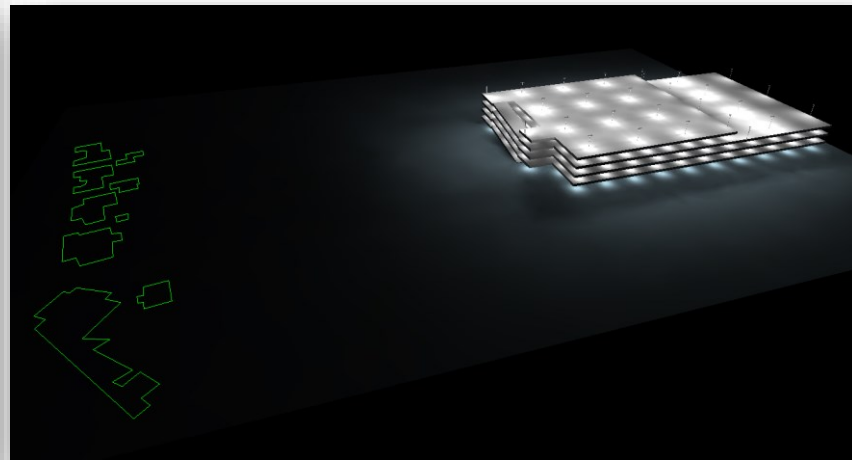
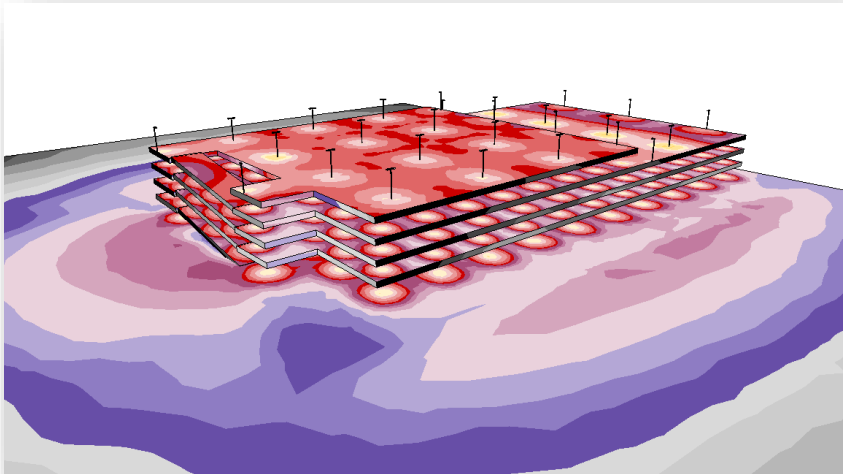
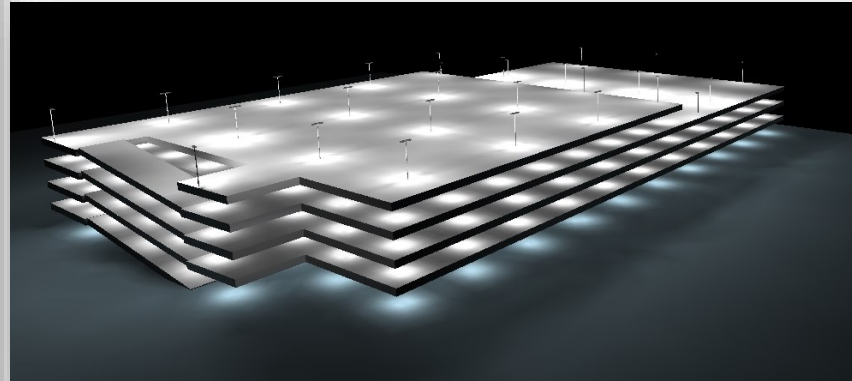
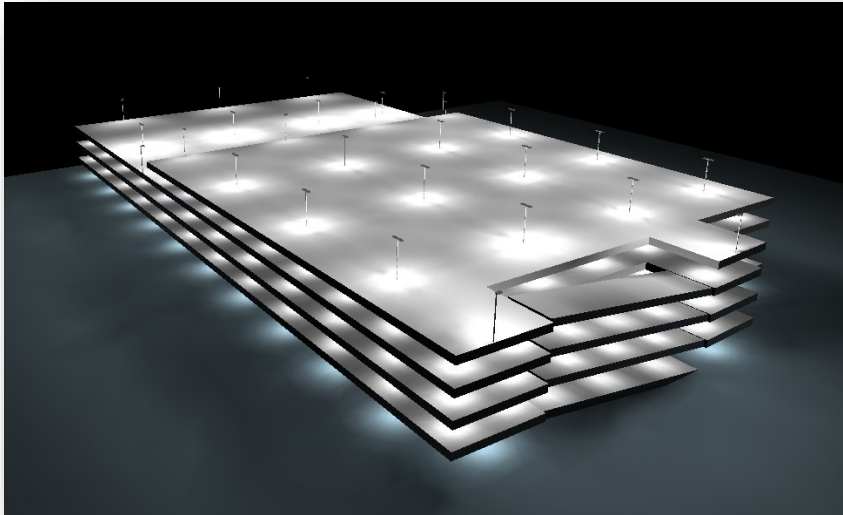
Lighting Column Locations

Level 4

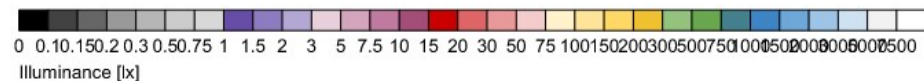
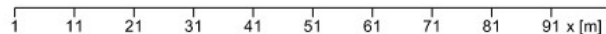
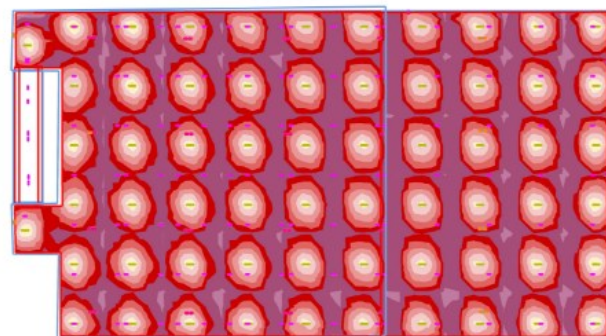


Type A Luminaire.
Post Top on 4M
column.

3D Visualisation



Lighting Calculations



General

Calculation algorithm used
Height of evaluation surface
Maintenance factor

Average indirect fraction
0.00 m
0.80

Total luminous flux
Total power
Total power per area (43408.82 m²)

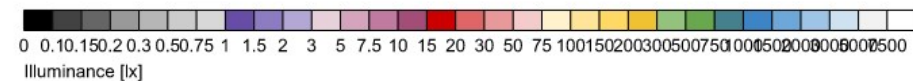
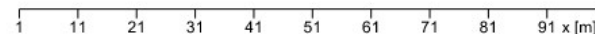
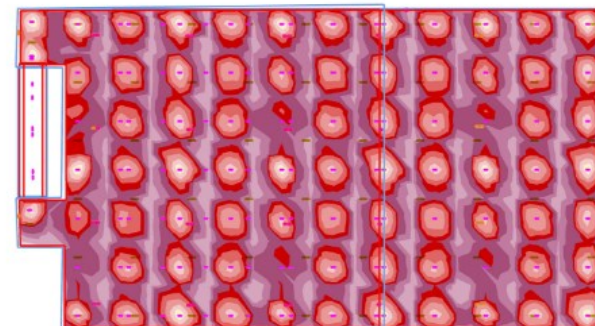
796479 lm
6059.4 W
0.14 W/m²

Illuminance

Average illuminance
Minimum illuminance
Maximum illuminance
Uniformity U_0
Diversity U_d

Em	26 lx
Emin	8 lx
Emax	102 lx
Emin/Em	1:3.18 (0.31)
Emin/Emax	1:12.4 (0.08)

Level 0



General

Calculation algorithm used
Height of evaluation surface
Maintenance factor

Average indirect fraction
3.22 m
0.80

Total luminous flux
Total power
Total power per area (43408.82 m²)

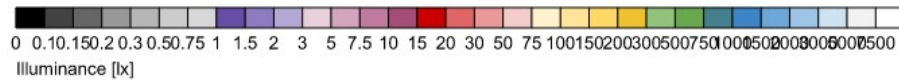
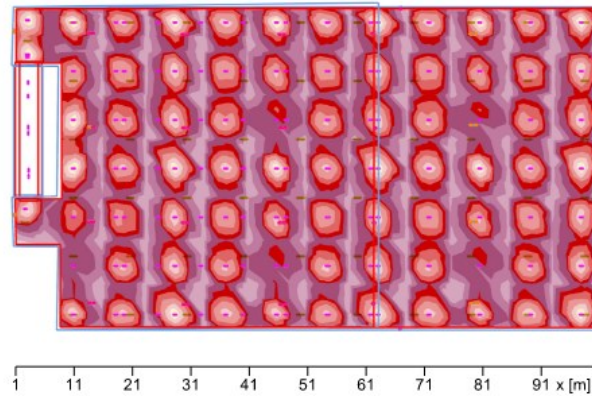
796479 lm
6059.4 W
0.14 W/m²

Illuminance

Average illuminance
Minimum illuminance
Maximum illuminance
Uniformity U_0
Diversity U_d

Em	20 lx
Emin	5 lx
Emax	105 lx
Emin/Em	1:3.88 (0.26)
Emin/Emax	1:19.9 (0.05)

Level 1



General

Calculation algorithm used
Height of evaluation surface
Maintenance factor

Average indirect fraction
6.00 m
0.80

Total luminous flux
Total power
Total power per area (43408.82 m²)

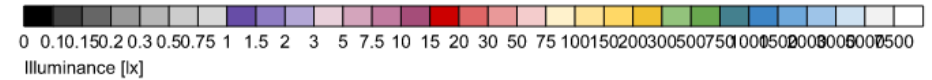
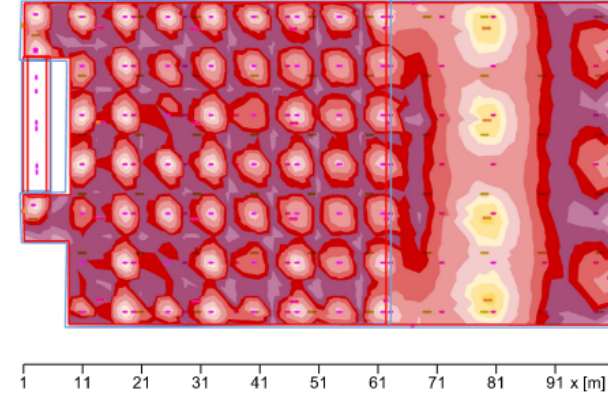
796479 lm
6059.4 W
0.14 W/m²

Illuminance

Average illuminance Em
Minimum illuminance Emin
Maximum illuminance Emax
Uniformity Uo Emin/Em
Diversity Ud Emin/Emax

20 lx
5 lx
105 lx
1:3.88 (0.26)
1:19.9 (0.05)

Level 2



General

Calculation algorithm used
Height of evaluation surface
Maintenance factor

Average indirect fraction
8.77 m
0.80

Total luminous flux
Total power
Total power per area (43408.82 m²)

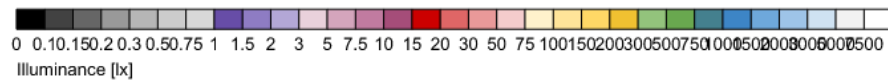
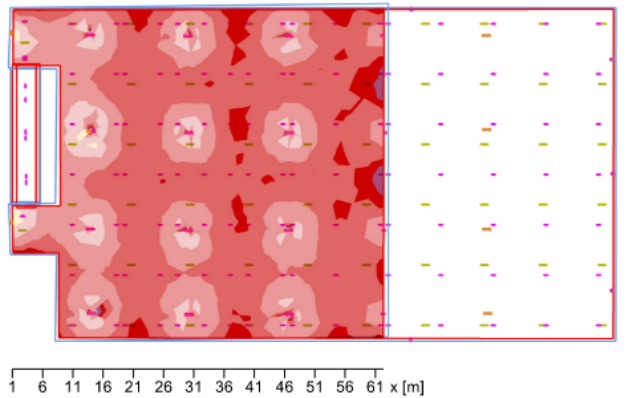
796479 lm
6059.4 W
0.14 W/m²

Illuminance

Average illuminance Em
Minimum illuminance Emin
Maximum illuminance Emax
Uniformity Uo Emin/Em
Diversity Ud Emin/Emax

28 lx
8 lx
140 lx
1:3.65 (0.27)
1:18.4 (0.05)

Level 3



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	11.55 m
Maintenance factor	0.80

Total luminous flux	796479 lm
Total power	6059.4 W
Total power per area (43408.82 m ²)	0.14 W/m ²

Illuminance

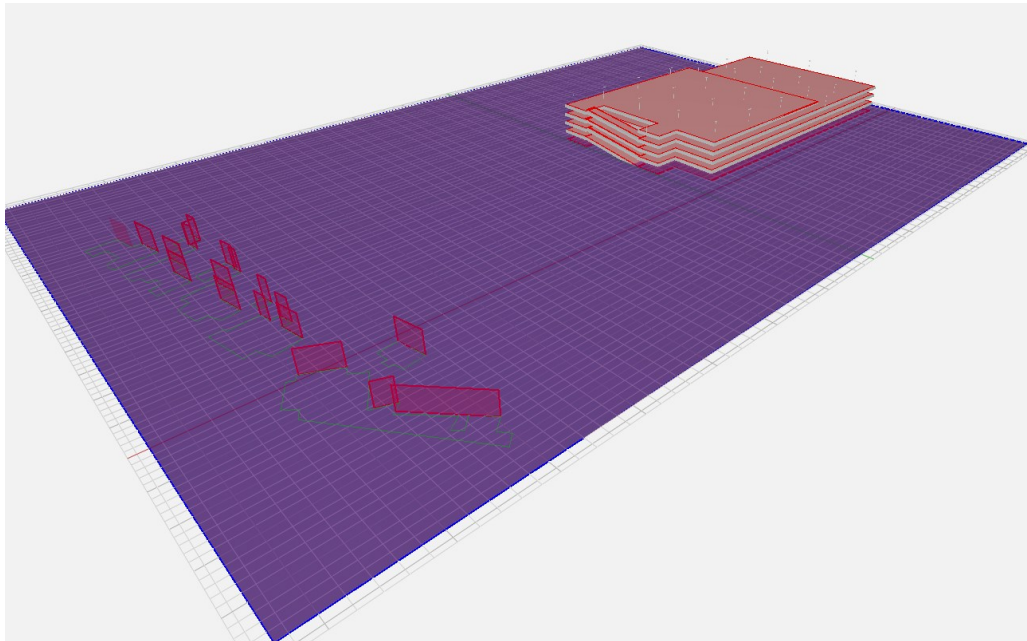
Average illuminance	Em	28.9 lx
Minimum illuminance	Emin	14.5 lx
Maximum illuminance	Emax	69.4 lx
Uniformity Uo	Emin/Em	1:1.99 (0.5)
Diversity Ud	Emin/Emax	1:4.78 (0.21)

Level 4

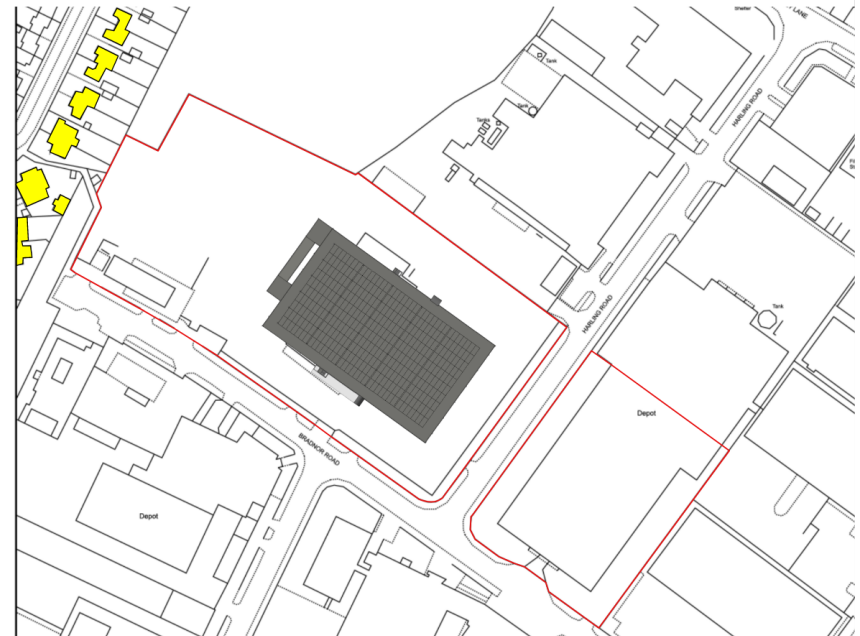
Sensitive Receptors

As part of the assessment and as detailed in the GN01:21 - Limitation of illumination on surrounding premises, we have undertaken the lighting calculation based on the sensitive receptors located the closest to the site. These being the residential dwelling located Northwest of the proposed car storage facility.

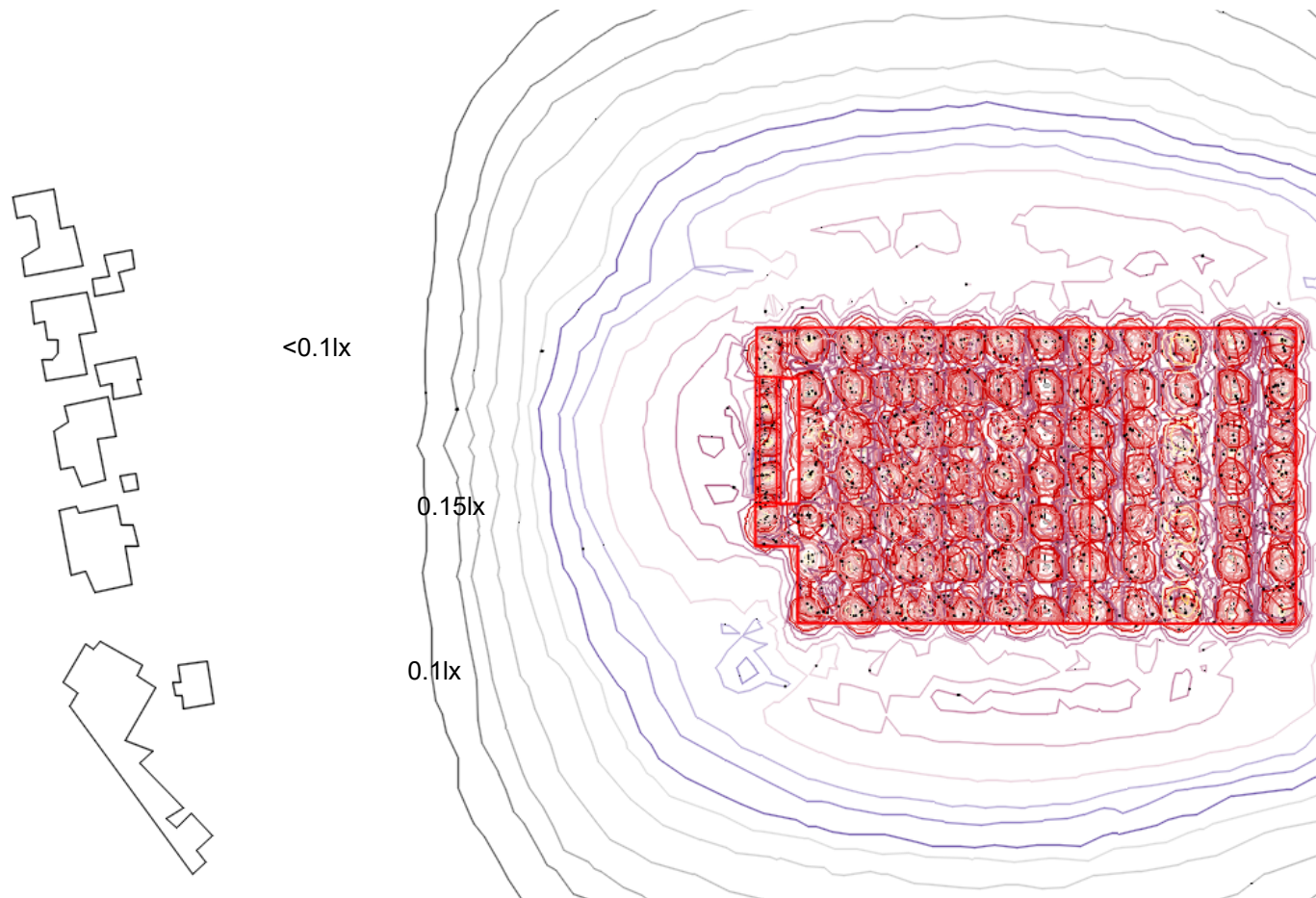
The calculation has included 19No vertical measurement planes on the properties, as identified below:



3D representation of the illumination source and vertical measurement planes.



Site plan indicating residential dwelling subject to assessment in yellow.



The calculations are based on no further obstruction between the sensitive receptors and the source. As can be seen in the isoline plot above, the lux value drops off to $<0.1lx$