Government Property Agency

AtkinsRéalis



MANCHESTER DIGITAL CAMPUS

Obtrusive Light Assessment Report

NOVEMBER 2024

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1. Introduction

1.1.1. AtkinsRéalis has been commissioned by GPA Manchester Digital Campus (MDC) to undertake an obtrusive light assessment. The purpose of this assessment is to evaluate the Proposed lighting conditions of the development and to determine any potential obtrusive light effects on the surrounding environment, including adjacent residential buildings and ecological habitats. The report specifically addresses the impact on residential receptors, local flora and fauna.

1.2. Scope

1.2.1. The scope of this document is to assess the external lighting impact associated with the Proposed GPA Manchester Digital Campus. This evaluation includes identifying areas of concern related to light trespass into neighbouring properties, glare affecting roads and pathways, and sky glow that may alter the night sky quality. Considerations for local flora, fauna, and specific species such as bats will also be part of this assessment.

1.3. Aim of this document

1.3.1. This document outlines:

- The background to obtrusive light and associated guidance.
- Existing baseline lighting conditions prior to construction of the Proposed development.
- The Proposed lighting condition within the North and South buildings and its effect on the immediate surroundings.
- Environmental limitations that may be placed on the proposed lighting of the development, in accordance with current standards and guidance.
- Expected levels of external illumination for the tasks and operations associated with the Proposed Development in accordance with relevant standards, guidance, and current best practice.
- Equipment performance requirements that are likely to achieve compliance with both exterior artificial lighting and environmental guidance.
- Recommendations for lighting design to comply with the requirements of the Clean Neighbourhoods and Environment act 2005 (CNEA) by adopting the best practice guidance of described in the ILP GN01/21.

2. Background

2.1.1. This section outlines the objectives and context for the obtrusive light assessment, including the location and description of the Site, details of the Proposed Development, and lighting provisions.

2.1.2. The key objective of the obtrusive light assessment is:

- **Evaluate light spill:** Assess the potential for artificial light from the development to spill into adjacent residential areas, affecting residents' privacy and comfort.
- **Assess glare risk:** Analyse the risk of glare affecting pedestrians and motorists in the vicinity of the Proposed Development.

- **Determine sky glow impact:** Evaluate the potential for increased sky glow, which may degrade the quality of the local night sky.
- **Impact on local flora:** Study how artificial lighting may affect local plant life, particularly species sensitive to light.
- **Impact on local fauna:** Assess the effect of artificial lighting on local wildlife, especially nocturnal animals.
- **Consideration for bats:** Develop specific lighting considerations to avoid disturbance to local bat populations, as they are sensitive to certain lighting conditions.
- **Recommend mitigation measures:** Propose measures to minimize obtrusive lighting impacts, ensuring minimal disturbance to the environment and compliance with relevant regulations.

2.1.3. This report will discuss:

- Summary of the assessment methodology used to evaluate the impacts of artificial lighting.
- Findings from both daytime and nighttime Site surveys.
- Evaluation of the effects of the Proposed lighting on nearby receptors.
- Details of the lighting conditions and operation requirements for different tasks.
- Compliance with lighting levels for current Site operations.
- Recommendations for control and mitigation measures to reduce the impact of artificial lighting on the environment.

2.2. Site location and description

2.2.1. The Proposed Development for the GPA Manchester Digital Campus is situated within the Greater Manchester area, with a national grid reference (Ordnance Survey) of SJ 85031 98455. The coordinates of the Site are approximately 53.482599°N, 53.482599 , -2.2270355°W. The campus is in a mixed-use urban area bordered by several streets:

- Great Ancoats Street to the south.
- Old Mill Street to the east.
- Redhill Street to the west.
- A school area and residential buildings surround the Site to the north and east.

2.2.2. The Site will house civil service office campus. The surrounding area includes residential buildings, making it crucial to assess the potential impact of Proposed Development lighting on these residential receptors.

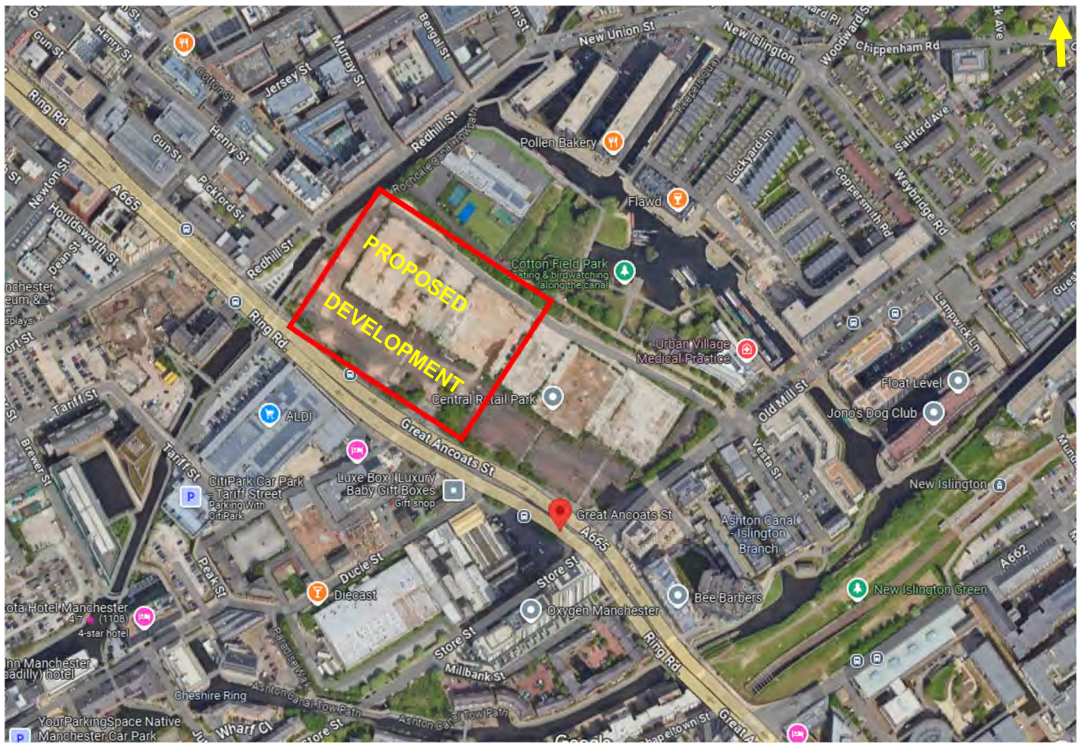


Figure 2-1 – Site Location Map

2.3. Existing lighting provision

2.3.1. There is a system of street lighting in and around the environs of the Proposed Development.

2.3.2. The visual daytime and dark survey (non-intrusive) undertaken within the surrounding highlighted the following –

- The existing lighting system within the Proposed Development consist of the mixture of 10m, 12m height, galvanised tubular steel columns, mounted with a variety of post top and side entry luminaire. The area features a mix of 10m and 12m height columns, using a combination of 3000K and 4000K HID and LED luminaires.
- The existing road, area and task lighting installation were operational at the time of the survey.
- The road lighting luminaires appear to be controlled and switched via Central Management System.

2.3.3. Refer Figure 2-2 for the exiting lighting installation surrounding the Proposed development.

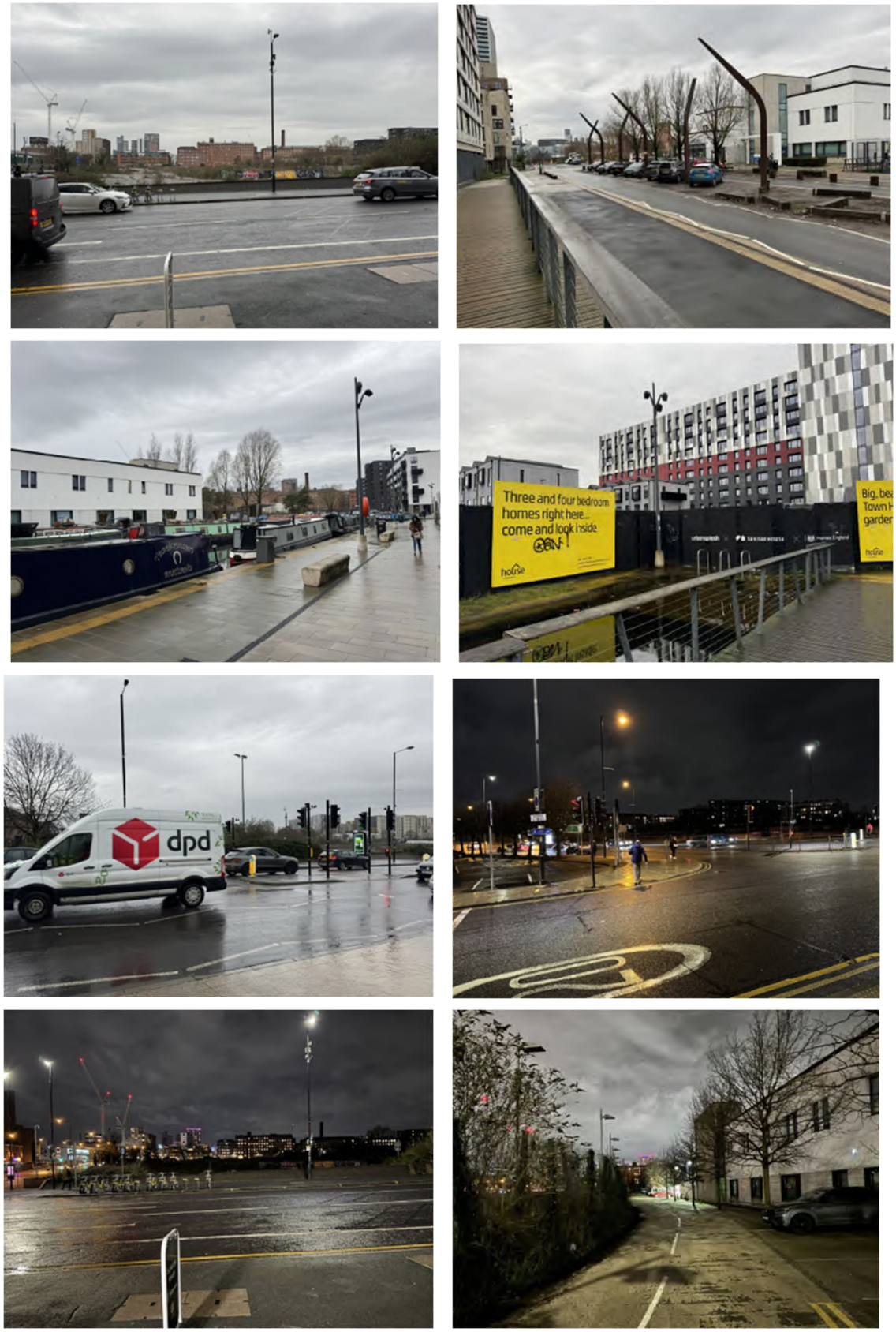


Figure 2-2 – Existing lighting luminaires around the Site

2.4. Proposed Development

2.4.1. The GPA Manchester Digital Campus development consists of two office buildings, North building and South building. The Proposed Development also includes the creation of public realm enhancements and improved frontage to Great Ancoats Street.

2.4.2. The Proposed Development will have proposed landscape, architectural and functional lighting.

2.4.3. It is worth noting that the Proposed Development is in the centre of a city centre with densely populated residential buildings, commercial properties, and is bound by the Co-Op Academy New Islington, Cotton Field Park and New Islington Marina.

2.4.4. It should be noted that the Proposed Development is the first stage development of the whole former Central Retail Park site. Proposals for the second stage will be subject to a separate planning application. The second stage development is likely to block views of the Proposed Development for eastern receptors

2.5. Information source and reference

2.5.1. This following documents were used to support the lighting assessment:

- Concept Lighting Plan (Environmental Statement Volume 4 – Appendix 2.1: Planning drawing pack, reference number MDCX-ATR-ZZ-ZZ-DR-L-231010)
- Landscape / Public Realm Masterplan (Environmental Statement Volume 4 – Appendix 2.1: Planning drawing pack, reference number MDCX-ATR-ZZ-ZZ-DR-L-231000)
- Topographical Survey (Environmental Statement Volume 4 – Appendix 2.1: Planning drawing pack, reference number MDCX-ATR-XX-XX-DR-A-021003)
- Illustrative Masterplan (Environmental Statement Volume 4 – Appendix 2.1: Planning drawing pack, reference number MDCX-ATR-XX-XX-DR-A-021006)
- Environmental Statement Volume 2 – Chapter 8: Biodiversity

2.6. Environmental Statement

2.6.1. The environmental statement forms a crucial part of this obtrusive lighting assessment. The potential adverse effects of the lighting on local residents, flora, and fauna will be addressed in this report taking into consideration the constraints, requirements and recommendations highlighted within the Environmental Statement here -

2.6.2. **Referred from Environmental Statement Volume 2 – Chapter 8: Biodiversity;** This chapter of the Environment Statement (ES) assesses the likely ecological effects of the Proposed Development. The chapter also describes the assessment methodology, the existing baseline conditions, potential impacts, assessment of effects, the mitigation measures required to prevent, reduce or offset any significant adverse effects and the likely residual effects after these measures have been employed.

3. Legislation, policies, standards and guidance

3.1.1. The baseline assessment for the Proposed Development has been undertaken in accordance with the legislation, policies, standards, and best practice guidance described in this section.

3.1.2. The standard cut-off date applicable to this report is November 2024, should any standard be updated after this date, implementation of the revised standard will have to be agreed with all relevant parties. Any safety critical aspect of the standard will be given priority for implementation.

Clean Neighbourhoods and Environmental Act 2005 (CNEA)

3.1.3. The Clean Neighbourhoods and Environment Act 2005 (the 'CNEA') grants the local authorities' and Environmental Agency additional powers to deal with artificial lighting by classifying artificial light emitted from defined premises as a statutory nuisance.

3.1.4. The CNEA amends Section 79 of the Environmental Protection Act 1990 to extend the statutory nuisance regime to include light spill and glare (emitted from certain premises) defined as, "(fb)artificial light emitted from premises so as to be prejudicial to health or a nuisance;". Several defined types of premises are exempt from this provision, including premises where higher levels of light are to be expected for the purposes of safety, such as airports and lighthouses.

3.1.5. Guidance produced on Sections 101 to 103 of the CNEA by the Department of Environment, Food and Rural Affairs (DEFRA) extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances, including situations where a nuisance arises from the use of artificial lighting. It should be noted that a highway is not deemed to be a premises under the CNEA, therefore light emitted from a highway lighting installation cannot be deemed a nuisance.

3.1.6. Artificial light emitted from an airport, harbour premises, railway premises, tramway premises, a bus station and any associated facilities, a public vehicle operating centre, a goods vehicle operating centre, a light house or a prison are exempt from these changes. It should be noted that the Proposed Development does not fall into any of the exempt premise types.

3.1.7. Other premises would also comply with the legislation where the operator employs "best practicable means" to prevent, or to counteract the effects of any light nuisance in respect to:

- Artificial light emitted from industrial, trade or business premises; or
- The artificial light (not being light to which the above applies) is emitted by lights used for the purpose only of illuminating an outdoor relevant sports facility.

3.1.8. It should be noted that highway lighting installations are not included as part of the CNEA, and therefore cannot be deemed as a statutory nuisance. However, the issues relating to artificial lighting and its potential effects on the environment and health of individuals is a topic of constant discussion within the highway lighting industry and manufacturers and designers alike employ good standard industry practices to reduce or minimise the effects of artificial lighting.

National Planning Policy Framework

3.1.9. The National Planning Policy Framework (NPPF) sets out the government's policies and principles with respect to land use planning, including lighting. NPPF has been introduced as a more succinct and fit for planning document to support and guide developers and designers in relations to design, construction, and operation of relevant developments within the UK. The policy document noted the need to consider any likely and or cumulative effect on health and environment caused by new development and ensure these effects are mitigated. Refer to extract below:

"Planning policies and decisions should also ensure that new development is appropriate for its location considering the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."

3.1.10. The National Planning Policy Framework (NPPF) identifies pollution as 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.

National Planning Practice Guidance

3.1.11. The National Planning Practice Guidance (NPPG) is an easily accessible web-based resource launched through the Department for Communities and Local Government in 2014 to support the NPPF by providing an overview of the subject for planners about when lighting pollution concerns should be considered. The light pollution subject is summarised under the following discussion points:

- When is light pollution relevant to planning?
- What factors should be considered when assessing whether a development proposal might have implications for light pollution?
- What factors are relevant when considering where light shines?
- What factors are relevant when considering when light shines?
- What factors are relevant when considering how much the light shines?
- What factors are relevant when considering possible ecological impacts?

Local Guidance

3.1.12. Manchester's Core Strategy 2012-2027

Policy EN 15 Biodiversity and Geological Conservation states: "The Council will seek to maintain or enhance sites of biodiversity and geological value throughout the City. Consideration will be given to sites with international or national designations for their biodiversity value. Manchester contains one Site of Special Scientific Interest (SSSI) (Cotteril Clough); there is a Special Area of Conservation (SAC) and an SSSI just over the border in Oldham (both on the Rochdale Canal within Oldham); other sites of biodiversity value, including Sites of Biological Importance (SBIs) and Local Nature Reserves (LNRs); Manchester currently has 35 SBIs (including the Rochdale and Ashton Canals) and 7 LNRs; priority habitats found within Manchester, as listed in the Manchester Biodiversity Strategy and included in the Greater

Manchester Biodiversity Action Plan (GM BAP); protected and priority species, as listed in the Manchester Biodiversity Strategy and included in the Greater Manchester Biodiversity Action Plan (GM BAP); sites that are recognised for their geological importance; the Council's objective to protect and conserve the City's existing trees and woodlands and the aim for a net increase in trees across the City Developers will be expected to identify and implement reasonable opportunities to enhance, restore or create new biodiversity, either on-site or adjacent to the site, contributing to linkages between valuable or potentially valuable habitat areas where appropriate, with reference to: the Manchester Biodiversity Strategy, which provides further details of priority habitats within Manchester and opportunities for biodiversity enhancement including corridors such as the Mersey, Medlock and Irk river valleys, the canals and disused railway lines and areas of managed greenspace particularly in parks; the Green Infrastructure Framework for Greater Manchester, which encompasses an ecological framework that seeks to guide and inform habitat creation and repair including identifying large 'biodiversity opportunity areas' including the Moston Brook Corridor and Knutsford Vale; the Open Space, Sport & Recreation Study, which identifies areas where there is a deficit of natural and semi-natural greenspace, opportunities for green corridors and other linkages; Manchester's Climate Change Action Plan; the Strategic Flood Risk Assessment (SFRA) for Manchester; the Habitats Regulations Assessment (HRA) for Manchester, which gives detailed consideration to Special Areas of Conservation (SACs), including the Rochdale Canal SAC just outside the district boundary; the River Basin Management Plan for the North West; the Manchester Tree Strategy. Any adverse impacts on biodiversity will need to be justified against the wider benefits of the proposal, assessed against other LDF policies. Where adverse impacts are unavoidable, developers will be required to provide appropriate mitigation and/or compensation."

Standards and guidance document

3.1.13. Applicable guidance for lighting designers on this subject of obtrusive light from artificial lighting provision and potential mitigations is predominantly covered by the following documents:

- CIE 150:2017 Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (Commission Internationale de l'Eclairage, 2017)
- CIE 126:1997 Guidelines for Minimizing Sky Glow (Commission Internationale de l'Eclairage, 1997)1
- BS EN 12464-2:2014 Light and lighting – Lighting of workplaces – Part 2: Outdoor workplaces (BSI, 2014).
- BS EN 12464-2:2007 Light and lighting – Lighting of workplaces – Part 2: Outdoor workplaces (BSI, 2007).
- BS 5489-1:2020 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas (BSI, 2020).
- BS EN 13201 (all parts) Road lighting (BSI, 2014,2015).
- **ILP Guidance Note 01/21, The Reduction of Obtrusive Light (GN01/21)** - At a national level, the Institution of Lighting Professionals (ILP) has produced GN01/21 to assist and guide designers on criteria and requirements to be considered in relations to obtrusive light.
- ILP Guidance Note 08/23, Bats and Artificial Lighting at Night (GN08/23)
- ILP PLG 04 Guidance on Undertaking Environmental Lighting Impact Assessments (PLG04 -2013).

[1] https://www.gov.uk/government/publications/national-planning-policy-framework--2
[2] https://www.gov.uk/guidance/light-pollution

4. Obtrusive light and nuisance

4.1. The need to light.

4.1.1. A well-designed lighting installation transforms a space after dark: allowing it to be used safely and effectively for a range of activities including providing safe outdoor workplaces, driving, cycling, and walking.

4.1.2. There is a general correlation between the complexity of a task, or how hazardous that task is, and the level of illumination required to safely undertake the task. Owners with more complex and hazardous spaces will generally provide greater levels of illumination, in-line with national, international and industry standards and guidance.

4.1.3. The Workplace (Health, Safety and Welfare) Regulations 1992, as enforceable under the Health and Safety at Work Act 1974, maintain that safe lighting must be provided in all premises, including outdoor places, for all workplace activities, which include those carried out during construction and operation of the Proposed development.

4.1.4. Obtrusive light is now a statutory nuisance as defined by the CENA.

4.2. How much light is required?

4.2.1. The level of lighting depends upon the area to lit for safety and task to be undertaken to ensure that it can be performed safely. In general, national bodies including British Standards, The Institution of Lighting Professionals (ILP), Society of Light and Lighting (SLL) and The Chartered Institution of Building Services Engineers (CIBSE) prescribe required lighting levels. Section 3, 4 and 5 contains relevant legislative, standards and guidance documents for implementing compliant and sustainable artificial lighting solutions.

4.3. Impact of artificial lighting

4.3.1. Whilst it is recognised that lighting needs to be provided to safeguard and enhance our night-time environment, incorrect application and control of lighting can be detrimental to our health and wellbeing and the local environment, in the form of obtrusive light and nuisance.

4.4. Obtrusive light

4.4.1. Obtrusive Light sometimes described as “light pollution” can present serious physiological, and ecological problems, if not controlled properly. Obtrusive light can take various forms as described below.

Sky glow

4.4.2. The release of light into the night sky, brightening the horizon, creates what is known as sky glow (as can be seen over most towns and cities) and reduces the enjoyment of the night sky by reducing the visibility of stars.

Glare

4.4.3. The uncomfortable brightness of a light source when viewed against a darker background. Glare occurs where a direct view of the light source presented to the viewer is a visual distraction or disability to normal vision and may present a hazard depending upon the intensity of the light source and the distance to the viewer.

Light Spill

4.4.4. The spilling or release of light beyond the boundary of the area being lit and serves no useful purpose.

Light Intrusion ('Nuisance')

4.4.5. This form of obtrusive light which may cause nuisance to others, or adversely affect fauna and flora as well as waste money and energy.

4.4.6. Refer to Figure 4-1 for an example of Sky Glow and Glare due to artificial lighting.

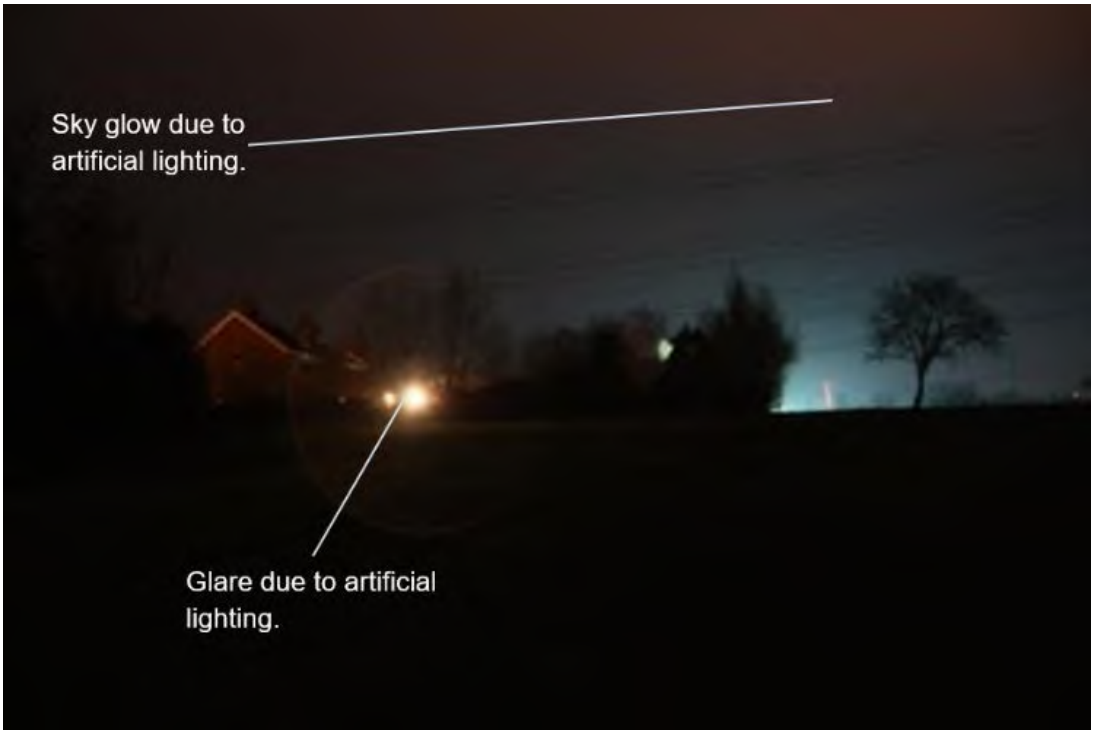


Figure 4-1 – Example of Sky glow and glare due to artificial lighting

4.4.7. The correct level of lighting must be carefully considered and selected to suit the task being undertaken, while ensuring that only the light necessary for the task is brought to bear. Excessive lighting is not only energy inefficient but can be detrimental to human health and wellbeing and the local environment and ecology such as influencing wildlife behaviours.

4.5. Mitigating light nuisance

4.5.1. Preliminary justification to provide artificial lighting should be considered by exploring the necessity to light, the effect it could have on others, the potential to cause nuisance and the

adverse effect, possible mitigation, and management of adverse effects from lighting installations.

4.5.2. The relevant limitations detailed in ILP GN01/21 should applied as required.

4.5.3. Mitigation measures for consideration on the Proposed lighting design will include the following:

- Light spill onto potential habitats for bats including potential planted linear features or buffer areas around the boundary of the Proposed Development to be avoided primarily through good design and secondarily by physical shields, hoods, louvres etc where necessary.
- The extent of light spill likely to affect potential wildlife habitats to be minimised through careful selection of equipment and robust design.
- Proposed lighting solution to utilise LED light source with colour temperature not exceeding 3000K at all locations. LEDs are fundamentally a directional light source due to their hemispherical construction. When combined with good luminaire design this can reduce or remove light spill and those emitted into the sky. It is understood that Ultraviolet (UV) and blue light content is the main concern with regards to light spill affecting flora and fauna as it can interrupt circadian rhythms and encourage plant life growth at an unnatural rate. LED with a 3000K colour temperature or less will reduce the amount of blue light emitted by the luminaire compared to a more standard Cool White LED solution employed in earlier LED luminaire versions. Overall, UV output of the LEDs (below 400nm) is extremely low.
- Ideally, areas identified for bats roosting and bat flightpaths to be kept dark, preferably at bat emergence and during peak bat activity periods.
- Where possible, proposed lighting columns to be sited such that lighting is kept as far as practicable from potential bat crossing points, and tree lines.
- A ‘buffer zone’ of very low illuminance (if any) to be created adjacent to potential key bat habitats.
- In accordance with GN08, a wider system of zoning may be employed to mitigate against artificial lighting.
- Dark buffers and concentric zonation
- A buffer zone subdivided to into smaller zones of increasing illuminance limit further away from the supporting Habitat would ensure light levels (illuminance - measured in lux) do not exceed certain defined limits. This has the effect of a gradual decrease in lighting from the developed zone, rather than a distinct cut-off, which may provide useable area for the project which also limits lighting impacts on less sensitive species, or less well-used habitat.
- The ecologist (in collaboration with a lighting professional) can help determine the most appropriate buffer widths and illuminance limits according to the value of that habitat to bats. Figure 4-2 gives an example of a multi-zoned approach which includes key habitat (Zone A) which would receive no Artificial Light at Night (ALAN) and supporting habitat (Zones B and C) which would act as a ‘light attenuation zone’, but remain within the public realm, and so receive reduced light levels.

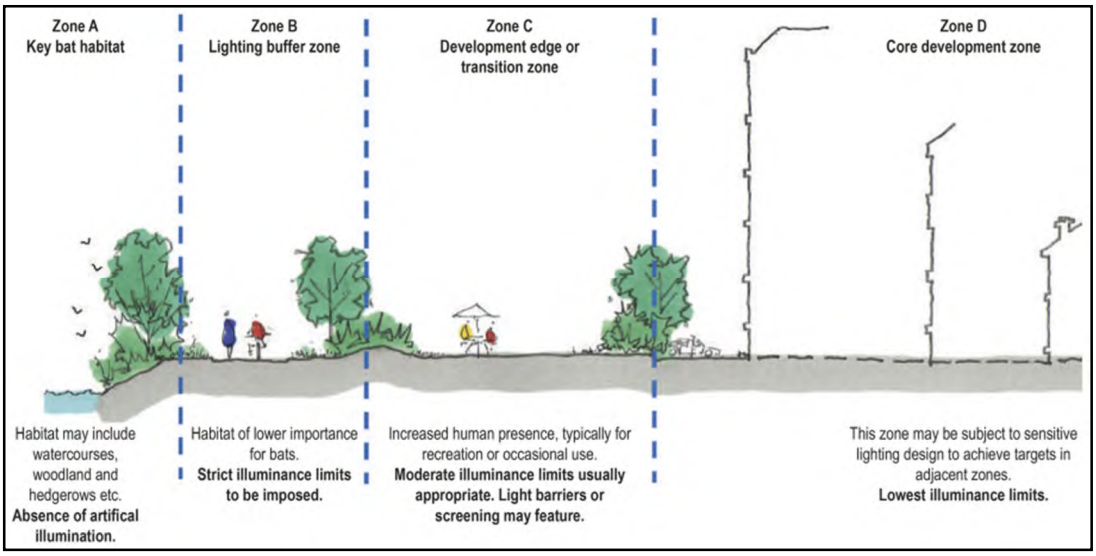


Figure 4-2 – Example of Zoning from ILP GN08/23

4.5.4. Published legislation, policies, standards, and guidance documents provide methods and basis to mitigate any form of obtrusive lighting aspects associated to most lighting tasks when followed and applied appropriately.

4.5.5. Consideration should also be given to other factors separately from the effect of external lighting installations that could become a source of illumination to the exterior environment. Such factor includes office buildings with extensive use of glass without blinds, screens, or curtains.

4.5.6. The fundamental elements of a lighting system which consist of a light source, a luminaire integrating an optical control system and method of installation/ mounting should be considered and selected cautiously at planning and design stage. In addition, a robust lighting design will ensure that the required light, at the right time, in the right place, controlled by the right system is achieved whilst forms of obtrusive light can be significantly mitigated without detriment to the requirements of the task.

5. Method of assessment

5.1.1. The evaluation of the lighting design for the Proposed Development involved a combination of visual Site surveys, detailed lighting calculations, and analysis of obtrusive light impacts. The visual survey identified key human receptors and potential issues such as light spill and glare, while also confirming the locations of potential ecological receptors noted in the ecology report. Lighting simulations were used to ensure the system would deliver sufficient illumination for safety without exceeding recommended illuminance levels, especially in residential areas.

5.1.2. The ecological impact was carefully evaluated to minimize disruption to local wildlife and flora, using low-wavelength, warm white lighting and controlling light spill. Additionally, the design was reviewed for compliance with international and local lighting standards, ensuring energy efficiency, sustainability, and the mitigation of obtrusive lighting through correct placement of luminaires and glare control measures. This holistic assessment guarantees that the lighting strategy balances operational needs with environmental responsibility and regulatory compliance.

5.2. Overview

5.2.1. The following section outlines the methodology undertaken for the assessment of the proposed lighting design for the Proposed development, which currently has no existing lighting. The assessment aims to establish baseline conditions and evaluate potential impacts of the proposed exterior lighting. The methodology follows established industry standards and guidance, ensuring compliance with relevant criteria outlined in Section 3 of this report.

5.2.2. The assessment was conducted by a qualified and competent lighting designer, in accordance with the criteria set out in relevant standards and guidance documents, as specified in Section 3.

5.2.3. The Proposed Development has the potential to cause the following impacts due to proposed artificial lighting provision associated with the operations activities:

- Increase in ambient light,
- Light Spill and Intrusion to surrounding residential buildings,
- Skyglow
- Potential glare to the residential receptors

5.2.4. Although there is no existing lighting on the MDC Site itself, an assessment was carried out to establish baseline lighting conditions in the surrounding area. This provides a reference point for designing the proposed lighting system. The assessment involved quantifying existing lighting levels in nearby locations and identifying applicable criteria from the Institution of Lighting Professionals (ILP) guidance to ensure the Proposed design aligns with industry standards. The methodology utilised for the assessment is summarised below:

- **Desk study** - An initial desk study was carried out by gathering, reviewing, and analysing information about the Proposed Development and its surroundings. This data was used to identify potential obtrusive light receptors, such as residential buildings, wildlife habitats and environmental sensitive areas.
- **Site visit** - A non-intrusive, visual survey of the Site and surrounding areas was conducted during both daytime and nighttime hours. The survey was carried out on Wednesday 15 February 2024 and Thursday 16 February 2024. A daylight survey was conducted between 13:00 to 16:30 hours, followed by a dark - time survey between 18:00 to 22:00 hours (after sunset). These surveys aimed to document existing views and establish the relevance of obtrusive light receptors identified during the desk study.
- **Guidance and legislation consideration** - The assessment applied relevant guidance and legislation, as outlined in Section 3 of this document, to ensure compliance with national and local standards
- **Evaluation and reporting** - Data collected from the desk study and Site surveys were analysed, and the results have been incorporated into this report. The findings help inform the proposed lighting design, ensuring it addresses potential impacts such as light spill, glare, and skyglow while maintaining appropriate lighting levels for the Proposed Development.

5.3. Study area

5.3.1. Initially, each representative viewpoint location has been selected for this baseline lighting assessment and survey; based on the potential view of the Proposed Development via desk study. Refer to Figure 5-1 for the viewpoint selected via desk study.

5.3.2. The viewpoint locations identified for this assessment correspond with the viewpoints assessed within the landscape of the Proposed Development and the neighbouring areas.



Figure 5-1 – Viewpoint locations including viewing direction.

5.3.3. The plan view of the viewpoint location including viewing direction is shown in Figure 5-1 whilst a detailed description of each viewpoint is provided in Table 5-1.

5.3.4. The Site is surrounded by both residential and commercial buildings. During the Site survey, 26 viewpoint locations were initially identified from the desk study. However, upon further examination, it was determined that two of these viewpoints (25 and 26) were associated with commercial properties, such as outlets of ALDI, M&S and Hotel Apartments. Since these properties would not be impacted by the Proposed Development.

Table 5-1 – Representative Viewpoint locations recommended for survey

Representative viewpoint Ref. No.	Viewpoint location description	OS Co-ordinates	Direction to Proposed Development	Visual Receptors
VP1	Alliance City Living	385172E, 398203N	North	Residential Building, Refer Table 5-3 and Figure 5-2
VP2	1-6 Outram	385223E, 398183N	North	Residential Building, Refer Table 5-3 and Figure 5-3
VP3	Bridge along Mulino Walk	385257E, 398163N	North	Residential Building, Refer Table 5-3 and Figure 5-4
VP4	Residential Building (Side of Great Ancoats Street)	385271E, 398138N	North	Residential Building, Refer Table 5-3 and Figure 5-5
VP5	Outside Sainsbury Entrance	385236E, 398259N	North	Residential Building, Refer Table 5-3 and Figure 5-6
VP6	Side of Lock gate Mews	385273E, 398292N	North	Residential Building, Refer Table 5-3 and Figure 5-7

Representative viewpoint Ref. No.	Viewpoint location description	OS Co-ordinates	Direction to Proposed Development	Visual Receptors
VP7	Side of 10 Old Mill Street	385309E, 398322N	West	Residential Building, Refer Table 5-3 and Figure 5-8
VP8	Side of One Vesta Street	385360E, 398354N	West	Residential Building, Refer Table 5-3 and Figure 5-9
VP9	Side of One Vesta Street	385412E, 398399N	West	Residential Building, Refer Table 5-3 and Figure 5-10
VP10	Weavers Quay	385357E, 398416N	West	Residential Building, Refer Table 5-3 and Figure 5-11
VP11(A)	Beside Weavers Quay	385346E, 398471N	West	Residential Building, Refer Table 5-3 and Figure 5-12
VP11(B)	Waters of New Islington Marina	385306E, 398451N	West	Houseboat, Refer Table 5-3 and Figure 5-13
VP12	Outside Keepers Quay	385249E, 398518N	West	Residential Building, Refer Table 5-3 and Figure 5-14
VP13	Outside Pollen Bakery	385208E, 398555N	West	Residential Building, Refer Table 5-3 and Figure 5-15
VP14	Outside second building of Cottom Field Wharf	385179E, 398576N	West	Residential Building, Refer Table 5-3 and Figure 5-16
VP15	Outside third building of Cottom Field Wharf	385143E, 398595N	West	Residential Building, Refer Table 5-3 and Figure 5-17
VP16	Beside Radium Street	385156E, 398660N	South	Residential Building, Refer Table 5-3 and Figure 5-18
VP17	Outside Royal Mill	385109E, 398620N	South	Residential Building, Refer Table 5-3 and Figure 5-19
VP18 - 19	Outside Royal Mill	385036E, 398556N	South	Residential Building, Refer Table 5-3 and Figure 5-20
VP20	Beside Pickford Street	384940E, 398485N	East	Residential Building, Refer Table 5-3 and Figure 5-21
VP21	Beside Pickford Street	384929E, 398473N	East	Residential Building, Refer Table 5-3 and Figure 5-22
VP22	Beside Port Street	384837E, 398486N	East	Residential Building, Refer Table 5-3 and Figure 5-23
VP23	Beside Port Street	384836E, 398474N	East	Residential Building, Refer Table 5-3 and Figure 5-24
VP24	Next to parking entrance of commercial outlets	384935E, 398415N	East	Next to ALDI Entrance, Refer Table 5-3 and Figure 5-25

Table 5-2 – Viewpoint locations not surveyed.

Representative Viewpoint Ref. No. not surveyed	Viewpoint	Justification
VP25	Commercial Outlet (ALDI, M&S)	No lighting impact due to operational hours.
VP26	Hotel Apartments	Out of line of sight.

5.4. Environmental zone

5.4.1. It is recommended that the local planning authority specify the environmental zone for exterior lighting control within their development plan. However, for this assessment, the environmental zone has been specified by a competent lighting designer based on experience from similar assessment.

5.4.2. The criteria used to provide a baseline for the impact of lighting on the surrounding environment are drawn from ILP GN01/21, based on the derived Environmental Zone. The five potential zones are contained in Table 5-3 which has been extracted from ILP GN01/21.

Table 5-3 – 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

Notes 1: Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

5.4.3. The baseline survey undertaken has established that the Proposed Development lies on a lit urban residential area corresponding with Environmental Zone E3 as defined by ILP GN01/21.

5.4.4. The Site is classified as Environmental Zone E3 for the purpose of this assessment.

5.4.5. The recommended maximum values of light param for the control of obtrusive light associated with proposed lighting installations within Environmental Zone E3 are detailed in Table 3 to 8 of ILP GN01:2021. These recommended values have been used to define the relevant recommended guidelines for this strategy to support the planning permission. Refer to Appendix A for the recommended values relevant to this assessment.

5.4.6. The limits published within the Table 3 to 8 of ILP GN01:2021 set upper performance levels above which the lighting would be considered as a nuisance within each environmental zone. Curfews are normally applied after a locally agreed hour when the lighting levels may be reduced or switched off.

5.5. Baseline Site survey

5.5.1. Two AtkinsRéalis lighting specialists conducted the Site survey on Wednesday, 15 February 2024, and Thursday, 16 February 2024. A daylight survey was carried out between 13:00 and 16:30, followed by a nighttime survey between 18:00 and 22:00 (after sunset) on both days to take ambient light measurements and document the lighting conditions at each viewpoint. Weather conditions were favourable and did not affect the lighting readings.

5.5.2. Readings of illuminance enable baseline lighting condition values to be determined for the Proposed Development and its surrounds. Such readings were taken at each viewpoint location:

- Vertically in each Receptor direction
- Vertically in each compass direction.
- Horizontally at ground level

5.5.3. Illuminance readings were taken using a Minolta T-10 light meter, calibrated on 7th May 2023 by an independent calibration service. The Luxmeter serial number is 20015255, and the sensor serial number is 30017293.

5.5.4. Light measurements were undertaken at 24 viewpoint locations to determine baseline light levels in the vicinity of the Site.

5.5.5. Photographs from each viewpoint location, in the direction shown in Figure 5-2 to Figure 5-25 were taken in daylight and after dark.

5.5.6. Photographs in other directions were also taken where lighting conditions were of interest.

5.5.7. A pro camera system, 48-megapixel camera, with 24mm, f/1.78 aperture second-generation sensor-shift optical image stabilisation, 100% Focus Pixels was used, with white balance adjusted to provide as accurate a depiction of reality as possible.

5.5.8. A commentary on each viewpoint location is contained in Table 5-4, together with day and selected night-time imagery.

5.5.9. VP Ref. in Table 5-4 represents Viewpoint Location Reference.

Table 5-4 – Viewpoint survey commentary and results

VP Ref.	Commentary
1	**Viewpoint 1** **Description of existing day-time view** Viewpoint 1 is located at the junction of Great Ancoats Street (north south), Old Mill Street (east), and Store Street (west), on a 20mph road with traffic signals. The viewpoint is partially screened by a 12m high trees. The area falls within Environmental Zone E3, indicating urban brightness. The weather during the Site visit was dry and cloudy.

View to the North: The Proposed Development is visible, with the trees at height of 12m partially blocking the view. Great Ancoats Street runs through the junction, contributing to the metropolitan landscape.
View to the East: The Old Mill Street leads past residential buildings, this is part of Viewpoints 5-9, giving this direction a more residential feel.
View to the West: Viewing to the west, Store Street features a retail store with an adjacent car park. The trees positioned in front of the car park partially obstruct the view of the Proposed Development from the lower floors from viewpoint 1. However, the Proposed Development is visible from the first and second floors.
View to the South: Viewing to the south, is the 80m-high Alliance City Living building. Trees screen up to 12m, but the upper floors have an unobstructed view of the Proposed Development.

Description of existing night-time view
The external lighting around this viewpoint offers adequate illumination, and high district brightness, especially given the busy nature of Great Ancoats Street. The area features a mix of 10m and 12m height columns, using a combination of HID luminaires of 3000K and LED 4000K light source. From Viewpoint 1, the scene appears active, with moderate to high traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. The combination of 3000K and 4000K lighting creates a slight glare in the view. The light spill is palely visible from the street lighting. The skyglow is noticeable due to the Site's location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	14.69lx
North (at 1.5m)	8.42lx
East (at 1.5m)	7.38lx
South (at 1.5m)	2.03lx
West (at 1.5m)	8.11lx


View to the North – Daytime

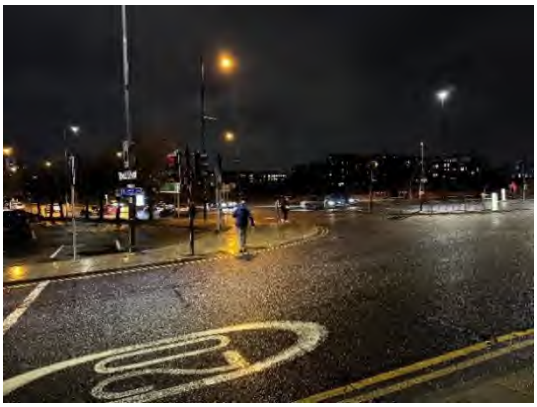

View to the North – Night-time

Figure 5-2 – Viewpoint 1: Daytime and night-time photos

2 **Viewpoint 2**
Description of existing day-time view
Viewpoint 2 is located outside the 1-6 Outram residential building, a three-floors construct adjacent to Great Ancoats Street. The area falls within Environmental Zone E3, indicating urban brightness. The weather during the Site visit was dry and cloudy.

View to the North: The Proposed Development is visible from this point, with Great Ancoats Street running through the junction, shaping the metropolitan landscape. Trees approximately 3m tall provide screening, blocking the ground-floor view of the building.
View to the East: Viewing to the east, Great Ancoats Street is lined with residential buildings across the road. 10m-12m street lighting columns are positioned on both sides of the street.
View to the West: Viewing to the west, the 1-6 Outram residential building is located. This three-floors building has trees in front that obstruct the Proposed Development from ground floor. However, the Site is visible from the first and second floors.
View to the South: Viewing to the south, the Great Ancoats street leads past residential and commercial buildings, and it is also the part of Viewpoints 3-4.

Description of the existing night-time view
The external lighting around this viewpoint offers adequate illumination, especially given the busy nature of Great Ancoats Street. The area features a mix of 10m and 12m columns, using a combination of HID luminaires of 3000K and LED 4000K light source. From Viewpoint 2, the scene appears active, with moderate to high traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. The combination of 3000K and 4000K lighting creates a slight glare in the view. The light spill is palely visible from the street lighting. The skyglow is noticeable due to the Site's location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	5.98lx
North (at 1.5m height)	7.81lx
East (at 1.5m)	8.53lx
South (at 1.5m)	5.78lx
West (at 1.5m)	8.89lx



View to the North – Daytime



View to the North – Night-time

Figure 5-3 – Viewpoint 2: Daytime and night-time photos

3 **Viewpoint 3**
Description of existing day-time view
Viewpoint 3 is located above the bridge along Mulino Walk, looking towards the Proposed Development. This viewpoint is located adjacent to Great Ancoats Street. The area falls within Environmental Zone E3, indicating urban brightness. The weather during the Site visit was dry and cloudy.

View to the North: The Proposed Development is visible from this viewpoint, with Great Ancoats Street running through the junction, shaping the metropolitan landscape. The lighting

columns feature post-top luminaires, with the lighting units mounted at a height of 12m. The street light arrangement follows an opposite placement pattern along the road, with no shielding on the luminaire.

View to the East: Viewing to the east, Great Ancoats Street is lined with residential buildings across the road. 10m-12m street lighting columns with opposite arrangements on both the sides.

View to the Wast: To the west, the Ashton Canal towpath crosses the bridge, but there is no view of the Proposed Development from this location.

View to the South: Viewing to the south, a nearby residential building rises four-floors. The ground floor view is completely blocked by a brick fence, while the first floor is partially screened by trees near the bridge. The second and third floors offer unobstructed views. The viewpoint is slightly elevated due to its location on the bridge, surrounded by several high-rise buildings. Great Ancoats Street runs past residential and commercial buildings and is part of Viewpoint 04.

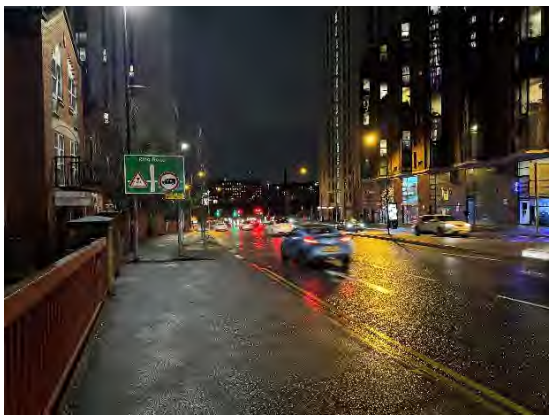
Description of the existing night-time view

The external lighting around this viewpoint offers adequate illumination, especially given the busy nature of Great Ancoats Street. The area features a mix of 10m and 12m columns, using a combination of HID luminaires of 3000K and LED 4000K light source. From Viewpoint 03, the scene appears active, with moderate traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. The combination of 3000K and 4000K lighting creates a slight glare in the view. The light spill is faintly visible from the street lighting. The skyglow is noticeable due to the Site's location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	6.74lx
North (at 1.5m)	13.65lx
East (at 1.5m)	9.38lx
South (at 1.5m)	2.95lx
West (at 1.5m)	8.85lx



View to the North – Daytime



View to the North – Night-time

Figure 5-4 – Viewpoint 3: Daytime and night-time photos

4 **Viewpoint 4**

Description of existing day-time view

Viewpoint 04 is located adjacent to Great Ancoats Street looking towards the Proposed Development. The area falls within Environmental Zone E3, indicating urban brightness. The weather during the Site visit was dry, windy and cloudy.

View to the North: The Proposed Development is visible from this viewpoint, with Great Ancoats Street running through the junction, shaping the metropolitan landscape. The lighting columns feature post-top luminaires, with the lighting units mounted at a height of 10m. The street light arrangement follows an opposite placement pattern along the road, with no shielding on the luminaire.
View to the East: Viewing to the east, Great Ancoats Street is lined with residential and commercial buildings across the road. 10m-12m street lighting columns with opposite placement on both the sides. The New Islington tram station is visible to the east of this viewpoint, which is also surrounded by green landscapes.
View to the Wast: Viewing to the west, connects to the Chapeltown street and Longacre street, but there is no view of the Proposed Development from this location.
View to the South: Viewing to the south, a high-rise residential and commercial building stands approximately 24 floors tall. The Proposed Development is visible from all floors of this building.

Description of the existing night-time view
The external lighting around this viewpoint offers adequate illumination, especially given the busy nature of Great Ancoats Street and to the west Chapeltown street and Longacre street. The area features a mix of 10m and 15m columns, using a combination of HID luminaires of 3000K and LED 4000K light source. From Viewpoint 4, the scene appears active, with moderate traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. The combination of 3000K and 4000K lighting creates a slight glare in the view. The light spill is faintly visible from the street lighting. The skyglow is noticeable due to the Site's location and viewpoint location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	12.85lx
North (at 1.5m)	6.52lx
East (at 1.5m)	15.25lx
South (at 1.5m)	4.33lx
West (at 1.5m)	5.48lx



View to the North – Day-time



View to the North – Night-time

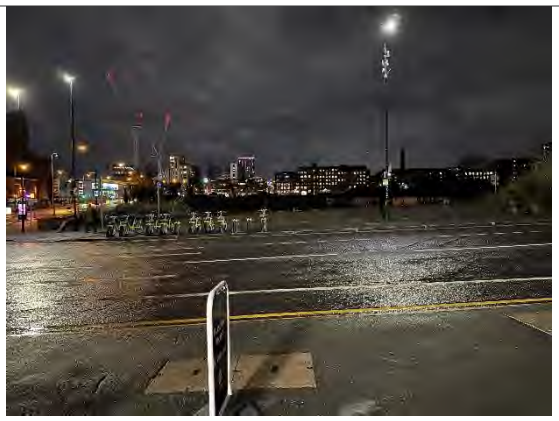
Figure 5-5 – Viewpoint 4: Daytime and night-time photos

5	**Viewpoint 5** **Description of existing day-time view** Viewpoint 5 is located outside Sainsbury Entrance facing the Proposed Development. The area is within Environmental Zone E3, characterized by urban brightness. During the Site visit, the weather was rainy and cloudy. **View to the North:** The view to the north from this viewpoint provides a clear sightline of the Proposed Development, with Old Mill Street intersecting the junction, contributing to the metropolitan character of the surrounding area. The streetscape is defined by a series of lighting columns, each equipped with post-top luminaires mounted at a height of 10m. These luminaires follow an alternating arrangement along either side of the road, enhancing the street's lighting coverage. **View to the East:** Viewing to the east along Old Mill Street is characterized by residential buildings lining the right side, which serve as the primary receptors for the Proposed Sevelopment Site. Viewpoints 6-9 are situated along this street, offering a consistent perspective from the residential side. The street is illuminated by 10m lighting columns arranged in an opposite placement pattern, enhancing urban brightness in line with Environmental Zone E3 standards. Partial tree screening provides some obstruction to the Proposed Development from the lower floors of the residential buildings, though views from higher floors remain largely unobstructed. The trees contribute to a natural buffer but do not significantly impact overall lighting conditions. **View to the Wast:** Viewing to the west shows the junction where Great Ancoats Street runs north south, intersecting with Old Mill Street to the east and Store Street to the west. This key junction connects major roads, contributing to the area's urban character and high activity levels, with surrounding infrastructure supporting traffic and pedestrian flow. **View to the South:** Viewing to the south features a 24-floors high-rise residential and commercial building. The Proposed Development is visible from all floors of this building. **Description of the existing night-time view** The external lighting around this viewpoint offers adequate illumination, especially given the busy nature of Old Mill Street. The area features a mix of 10m LED columns, which has 4000K colour temperature. From Viewpoint 5, the scene appears active, with moderate traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. No noticeable glare is visible from this viewpoint. The light spill is faintly visible from the street lighting. The skyglow is noticeable due to the Site's location and viewpoint location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	60.6lx
North (at 1.5m)	3.02lx
East (at 1.5m)	56.6lx
South (at 1.5m)	51.6lx
West (at 1.5m)	18.79lx



View to the North – Day-time



View to the North – Night-time

Figure 5-6 – Viewpoint 5: Daytime and night-time photos

6

Viewpoint 6

Description of existing day-time view

Viewpoint 6 is located side Lock gate Mews looking towards the Proposed Development. The area falls within Environmental Zone E3, indicating medium district brightness. The weather during the Site visit was rainy and cloudy.

View to the North: The Proposed Development is visible from this viewpoint, with Old Mill Street running, shaping the metropolitan landscape. The lighting columns feature post-top luminaires, with the lighting units mounted at a height of 10m. The street light arrangement follows an opposite placement pattern along the road, with no shielding on the luminaire. There are trees approx. 6m high which acts as a screening and block the partial views from ground to second floor.

View to the East: Viewing to the east, Old Mill Street is lined with residential buildings along the right side. Viewpoint 7-9 is located on the Old mill Street on the right side. All the residential buildings are the prime receptors for the Proposed Development. There are 10m street lighting columns with opposite placement on both the sides. There is a partial screening of the trees which block the views of the Proposed Development from the lower floors.

View to the West: Viewing to the west, there is a viewpoint 5 which is describe in above section and the junction where Great Ancoats Street passes from North to South and Old Mill Street to the east and Store Street to the west.

View to the South: Viewing to the south, a high-rise residential building stands approximately 09 stories tall. The Proposed Development is visible from all floors of this building.

Description of the existing night-time view

The external lighting around this viewpoint offers adequate illumination, especially given the busy nature of Old Mill Street. The area features a mix of 10m LED columns, which has 4000K colour temperature. From Viewpoint 05, the scene appears active, with moderate traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. No noticeable glare is visible from this viewpoint. The light spill is faintly visible from the street lighting. The skyglow is noticeable due to the Site's location and viewpoint location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	3.2lx
North (at 1.5m)	4.99lx
East (at 1.5m)	4.29lx
South (at 1.5m)	11.51lx

West (at 1.5m)	3.74lx



View to the North – Day-time



View to the North – Night-time

Figure 5-7 – Viewpoint 6: Daytime and night-time photos

7

Viewpoint 7

Description of existing day-time view

Viewpoint 7 is located side of 10 Old Mill Street looking towards the Proposed Development. The area falls within Environmental Zone E3, indicating medium district brightness. The weather during the Site visit was rainy and cloudy.

View to the North: Viewing to the north, Old Mill Street features residential buildings lining the right side, with Viewpoints 8-9 situated on this side. These buildings serve as the primary receptors for the Proposed Development. The street is illuminated by 10m lighting columns arranged in an opposite placement pattern on both sides. Partial tree screening obstructs views of the Proposed Development from the lower floors of the residential buildings.

View to the East: Viewing to the east, includes a 5-floors residential building adjacent to a maisonette. The Proposed Development is visible from all floors of this building; however, the ground floor view is obstructed by tree shrubs and a wooden fence.

View to the West: The Proposed Development is visible from this viewpoint, with Old Mill Street running, shaping the metropolitan landscape. The lighting columns feature post-top luminaires, with the lighting units mounted at a height of 10m. The street light arrangement follows an opposite placement pattern along the road, with no shielding on the luminaire. There are trees approx. 6m high which acts as a screening and block the partial views from ground to second floor.

View to the South: Viewing to the south, there is a viewpoint 5-6 which is describe in above section and the junction where Great Ancoats Street passes from North to South and Old Mill Street to the east and Store Street to the west.

Description of the existing night-time view

The external lighting around this viewpoint offers adequate illumination, especially given the busy nature of Old Mill Street. The area features a mix of 10m LED columns, which has 4000K colour temperature. From Viewpoint 5, the scene appears active, with moderate traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. No noticeable glare is visible from this viewpoint. The light spill is faintly visible from the street lighting. The skyglow is noticeable due to the Site's location and viewpoint location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	8.25lx

North (at 1.5m)	8.49lx
East (at 1.5m)	4.79lx
South (at 1.5m)	1.47lx
West (at 1.5m)	4.82lx



View to the West – Day-time



View to the West – Night-time

Figure 5-8 – Viewpoint 7: Daytime and night-time photos

8

Viewpoint 8

Description of existing day-time view

Viewpoint 8 is located side of one vesta street by old mill street. The area falls within Environmental Zone E3, indicating medium district brightness. The weather during the Site visit was rainy and cloudy.

View to the North: Viewing to the north, Old Mill Street features residential buildings lining the right side, with Viewpoint 9 situated on this side. This building serves as the primary receptors for the Proposed Development. The street is illuminated by architectural lighting columns, evenly spaced to provide illumination on both sides. Partial tree screening obstructs views of the Proposed Development from the lower floors of the residential buildings.

View to the East: Viewing to the east, includes a 7-floors residential building. The ground floor of the building is a car park, and the Proposed Development is visible from all floors of this building.

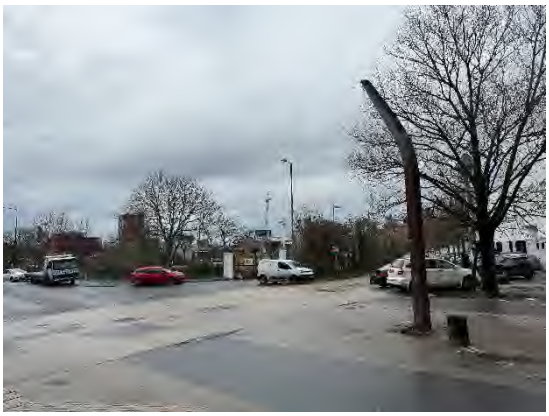
View to the West: The Proposed Development is visible from this viewpoint, with Old Mill Street running, shaping the metropolitan landscape. The lighting columns feature post-top luminaires, with the lighting units mounted at a height of 12m. The street light arrangement follows an opposite placement pattern along the road, with no shielding on the luminaire. There are trees approx. 6m high which acts as a screening, however it is assumed that the view of the Site from first to seventh floor is clearly visible.

View to the South: Viewing to the south, there is a viewpoint 5,6 and 7 which is describe in above section.

Description of the existing night-time view

The external lighting around this viewpoint offers adequate illumination, especially given the busy nature of Old Mill Street. The area features a mix of 12m LED columns, which has 4000K colour temperature. From Viewpoint 8, the scene appears active, with moderate traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. No noticeable glare is visible from this viewpoint. The light spill is faintly visible from the street lighting. The skyglow is noticeable due to the Site's location and viewpoint location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	9.83lx
North (at 1.5m)	20.71lx
East (at 1.5m)	12.48lx
South (at 1.5m)	7.84lx
West (at 1.5m)	6.71lx



View to the West – Daytime



View to the West – Night-time

Figure 5-9 – Viewpoint 8: Daytime and night-time photos

9

Viewpoint 9

Description of existing day-time view

Viewpoint 9 is located side of one vesta street by old mill street. The area falls within Environmental Zone E3, indicating medium district brightness. The weather during the Site visit was rainy and cloudy.

View to the North: Viewing to the north, Old Mill Street features residential buildings lining the right side. These buildings are not considered as the receptors for the Proposed Development as it is out of line of sight. The street is illuminated by architectural lighting columns, evenly spaced to provide illumination on both sides. Partial tree screening obstructs views of the Proposed Development from the lower floors of the residential buildings.

View to the East: Viewing to the east, includes a 7-floors residential building. The ground floor of the building is a car park, and the Proposed Development is visible from all floors of this building.

View to the West: The Proposed Development is visible from this viewpoint, with Old Mill Street running, shaping the metropolitan landscape. The architectural lighting columns feature post-top luminaires, with the lighting units integrated at a height of 8m. The street light arrangement follows an opposite placement pattern along the road, with no shielding on the luminaire. There are trees approx. 6m high which acts as a screening, however it is assumed that the view of the Site from first to seventh floor is clearly visible.

View to the South: Viewing to the south, there is a viewpoint 5,6 and 7 which is describe in above section and the junction where Great Ancoats Street passes from North to South and Old Mill Street to the east and Store Street to the west.

Description of the existing night-time view

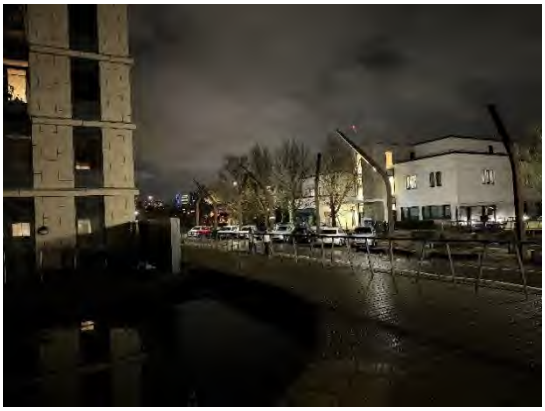
The external lighting around this viewpoint offers adequate illumination, especially given the busy nature of Old Mill Street. The area features a mix of 10m LED columns and architectural columns, which has 4000K colour temperature. From Viewpoint 5, the scene appears active, with moderate traffic flow, likely due to the nearby junction. The main sources of light are vehicle headlights, along with illumination from streetlights and lighting columns. No noticeable

glare is visible from this viewpoint. The light spill is faintly visible from the street lighting. The skyglow is noticeable due to the Site's location and viewpoint location.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	10.44lx
North (at 1.5m)	8.94lx
East (at 1.5m)	5.15lx
South (at 1.5m)	1.82lx
West (at 1.5m)	3.24lx



View to the West – Daytime



View to the West – Night-time

Figure 5-10 – Viewpoint 9: Daytime and night-time photos

10

Viewpoint 10

Description of existing day-time view

Viewpoint 10 is located beside Weaves Quay. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was dry and cloudy during the Proposed Development visit. The area appeared private and moderately busy.

View to the North: Viewing to the north, the New Islington Marina Prom features residential buildings on the right side, where Viewpoints 11-15 are located. These buildings are the main receptors for the Proposed Development. The street/public pathway is lit by 10m lighting columns positioned along the Marina. The New Islington Marina Walk, visible from this view, stretches from Viewpoint 10 to Viewpoint 15.

View to the East: Viewing to the east there is a 10-floors residential building. The proposed Site is assumed to be obscured from the ground to the second floor by the Ancoats Primary Care Centre (New Islington Medical Practice and Urban Village Medical Practice), which serves as a screen. However, the Proposed Development is visible from all upper floors of the building.

View to the West: The Proposed Development is visible from the second to ten floor of this viewpoint. Surrounding features, including New Islington Marina, houseboats, Ancoats Primary Care Centre, and Cotton Field Park, are also visible. The Marina Street walk is lit by lighting columns, and 6m high trees provide additional screening.

View to the South: Viewing to the south, there is a viewpoint 7,8 and 9 which is describe in above section.

Description of the existing night-time view

The external lighting at this viewpoint provides sufficient illumination, particularly for the busy New Islington Marina Prom. The area features 10m, LED columns with a 4000K colour temperature. From Viewpoint 10, the scene resembles a public realm, restricted to pedestrians and cyclists, with no vehicle access. The primary light source is from the lighting columns, with no noticeable glare. Light spill from the columns is faint, while skyglow is visible due to the Site's location and the viewpoint.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	8.99lx
North (at 1.5m)	1.37lx
East (at 1.5m)	8.87lx
South (at 1.5m)	9.68lx
West (at 1.5m)	2lx



View to the West – Day-time



View to the West – Night-time

Figure 5-11 – Viewpoint 10: Daytime and night-time photos

11

Viewpoint 11(A) – Residential Receptors (Under Construction)

Description of existing day-time view

Viewpoint 11 is located beside Weaves Quay. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was dry and cloudy during the Proposed Development visit. The area appeared private and moderately busy.

View to the North: Viewing to the north, the New Islington Marina Prom features residential buildings on the right side, where Viewpoints 12-15 are located. These buildings are the main receptors for the Proposed Development. The street/public pathway is lit by 10m lighting columns positioned along the Marina. The New Islington Marina Walk, visible from this view, stretches from Viewpoint 10 to Viewpoint 15.

View to the East: Viewing to the east, there is an ongoing construction of a residential building. It is assumed that the Proposed Development will be visible from all floors of this building once completed.

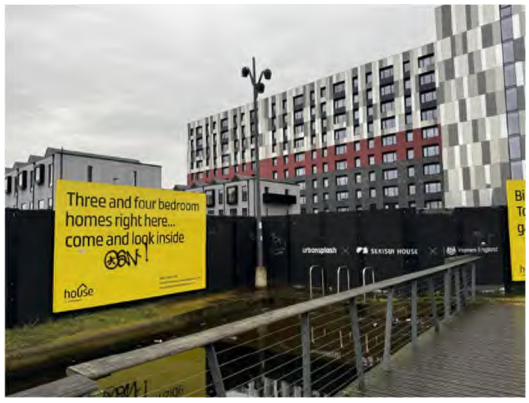
View to the West: It is assumed that the Proposed Development is visible from all floors of the under-construction residential building. Key features such as New Islington Marina, New Ancoats Primary Care Centre, and Cotton Field Park are also in view, while 6m high trees offer additional screening.

View to the South: Viewing to the south, there is a viewpoint 09 which is describe in above section.

Description of the existing night-time view

The external lighting at this viewpoint provides sufficient illumination, particularly for the busy New Islington Marina Prom. The area features 10m LED columns with a 4000K colour temperature. From Viewpoint 10, the scene resembles a public realm, restricted to pedestrians and cyclists, with no vehicle access. The primary light source is from the lighting columns, with no noticeable glare. Light spill from the columns is faint, while skyglow is visible due to the Site's location and the viewpoint.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	2.69lx
North (at 1.5m)	3.25lx
East (at 1.5m)	3.61lx
South (at 1.5m)	4.66lx
West (at 1.5m)	2.14lx



View to the West – Daytime



View to the West – Night-time

Figure 5-12 – Viewpoint 11(A): Daytime and night-time photos

11

Viewpoint 11(B) Boat Receptors

Description of existing day-time view

Viewpoint 11(B) consists of residents living in houseboats located in the waters of New Islington Marina. Due to ecological considerations, the existing lighting is of very low district brightness. During the visit to the Proposed Development, the weather was dry and cloudy. The surrounding public realm of New Islington Marina Prom appeared private and moderately busy.

View to the North: Viewing to the north, the New Islington Marina waters feature many residential living houseboats and residential buildings on the right side, where Viewpoints 12-15 are located. These buildings are the main receptors for the Proposed Development. The street/public pathway is lit by 10m lighting columns positioned along the Marina. The New Islington Marina Walk, visible from this view, stretches from Viewpoint 10 to Viewpoint 15.

View to the East: Viewing to the east, there is an ongoing construction of a residential building. It is assumed that the Proposed Development will be visible from all floors of this building once completed.

View to the West: Viewing to the west, the high floors of the Proposed Development will be visible. Key features such as New Islington Marina, New Ancoats Primary Care Centre, and Cotton Field Park are also in view, while 6-meter-high trees offer additional screening.

View to the South: Viewing to the south, there is a viewpoint 9 which is describe in above section.

Description of the existing night-time view

The external lighting at this viewpoint provides sufficient illumination, particularly for the busy New Islington Marina Prom. The area features 10m LED columns with a 4000K colour temperature. From Viewpoint 10, the scene resembles a public realm, restricted to pedestrians and cyclists, with no vehicle access. The primary light source is from the lighting columns, with no noticeable glare. Light spill from the columns is faint, while skyglow is visible due to the Site's location and the viewpoint.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	21.05lx
North (at 1.5m)	2.5lx
East (at 1.5m)	6.33lx
South (at 1.5m)	6.8lx
West (at 1.5m)	2.9lx



View to the West - Daytime



View to the West – Night-time

Figure 5-13 – Viewpoint 11(B): Daytime and night-time photos

12

Viewpoint 12

Description of existing day-time view

Viewpoint 12 is located outside Keeper Quays. The area falls within Environmental Zone E3 with the existing lighting having a medium district brightness. The weather was dry and cloudy during the Proposed Development visit. The area appeared private and moderately busy.

View to the North: Viewing to the north, the New Islington Marina Prom features residential buildings on the right side, where Viewpoints 13-15 are located. These buildings are the main receptors for the Proposed Development. The street/public pathway is lit by 10m lighting columns positioned along the Marina. The New Islington Marina Walk, visible from this view, stretches from Viewpoint 13 to Viewpoint 15.

View to the East: Viewing to the east, there is a five-story residential building. The ground floor features a restaurant and a salon, while the upper floors consist of residential apartments. The Proposed Development is visible from the first through fifth floors of the building.

View to the West: The Proposed Development is visible from the first to fifth floor of the residential building. Key landmarks like New Islington Marina, New Ancoats Primary Care Centre, and Cotton Field Park can also be seen. Additionally, 6m high trees provide some screening.

View to the South: Viewing to the south, there is a viewpoint 10-11 which is describe in above section.

	Description of the existing night-time view The external lighting at this viewpoint provides sufficient illumination, particularly for the busy New Islington Marina Prom. The area features 10m LED columns with a 4000K colour temperature. From Viewpoint 12, the scene resembles a public realm, restricted to pedestrians and cyclists, with no vehicle access. The primary light source is from the lighting columns, with no noticeable glare. Light spill from the columns is faint, while skyglow is visible due to the Site's location and the viewpoint.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	21.49lx
North (at 1.5m)	8.03lx
East (at 1.5m)	16.39lx
South (at 1.5m)	3.15lx
West (at 1.5m)	2.22lx



View to the West – Daytime



View to the West – Night-time

Figure 5-14 – Viewpoint 12: Daytime and night-time photos

13	**Viewpoint 13** **Description of existing day-time view** Viewpoint 13 is located outside Pollen Bakery. This is Cotton field wharf. The area falls within Environmental Zone with the existing lighting having a medium district brightness. The weather was dry and cloudy during the Proposed Development visit. The area appeared private and moderately busy. **View to the North:** Viewing to the north, the New Islington Marina Prom features residential buildings on the right side, where Viewpoints 14-15 are located. These buildings are the main receptors for the Proposed Development. The street/public pathway is lit by 10m lighting columns positioned along the Marina. The New Islington Marina Walk, visible from this view, stretches from Viewpoint 13 to Viewpoint 15. **View to the East:** Viewing to the east, there is a seven-floor + roof top residential building. The ground floor features a restaurant, while the upper floors consist of residential apartments. The Proposed Development is visible from the first through seven floors + roof top of the building. The cotton field wharf are the three connected buildings **View to the West:** The Proposed Development is visible from the first to seven floors + roof top of the residential buildings. Key landmarks like New Islington Marina, New Ancoats Primary Care Centre, Co-op Academy New Islington and Cotton Field Park can also be seen. Additionally, 6m high trees provide some screening. **View to the South:** Viewing to the south, there is a viewpoint 10-12 which is describe in above section.

Description of the existing night-time view

The external lighting at this viewpoint provides sufficient illumination, particularly for the busy New Islington Marina Prom. The area features 10m LED columns with a 4000K colour temperature. From Viewpoint 13, the scene resembles a public realm, restricted to pedestrians and cyclists, with no vehicle access. The primary light source is from the lighting columns, with no noticeable glare. Light spill from the columns is faint, while skyglow is visible due to the Site's location and the viewpoint.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	15.24lx
North (at 1.5m)	1.40lx
East (at 1.5m)	6.03lx
South (at 1.5m)	3.93lx
West (at 1.5m)	2.04lx



View to the West – Daytime



View to the West – Night-time

Figure 5-15 – Viewpoint 13: Daytime and night-time photos

14

Viewpoint 14

Description of existing day-time view

Viewpoint 14 is located outside second building of the Cotton field wharf. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was dry and cloudy during the Proposed Development visit. The area appeared private and moderately busy.

View to the North: Viewing to the north, the New Islington Marina Prom features residential buildings on the right side, where Viewpoints 15 is located. This building is the main receptor for the Proposed Development. The street/public pathway is lit by 10m lighting columns positioned along the Marina. The New Islington Marina Walk, visible from this view, stretches from Viewpoint 10 to Viewpoint 15.

View to the East: Viewing to the east, there is a seven-floor + roof top residential building. The ground floor features a restaurant, while the upper floors consist of residential apartments. The Proposed Development is visible from the first through seven floors + roof top of the building. The cotton field wharf are the three connected buildings

View to the West: The Proposed Development is visible from the first to seven floors + roof top of the residential buildings. Key landmarks like New Islington Marina, New Ancoats Primary Care Centre, Co-op Academy New Islington and Cotton Field Park can also be seen. Additionally, 6m high trees provide some screening.

View to the South: Viewing to the south, there is a viewpoint 10-13 which is describe in above section.

Description of the existing night-time view

The external lighting at this viewpoint provides sufficient illumination, particularly for the busy New Islington Marina Prom. The area features 10m LED columns with a 4000K colour temperature. From Viewpoint 14, the scene resembles a public realm, restricted to pedestrians and cyclists, with no vehicle access. The primary light source is from the lighting columns, with no noticeable glare. Light spill from the columns is faint, while skyglow is visible due to the Site's location and the viewpoint.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	22.02lx
North (at 1.5m)	16.5lx
East (at 1.5m)	4.81lx
South (at 1.5m)	2.42lx
West (at 1.5m)	8.75lx



View to the West – Daytime



View to the West – Night-time

Figure 5-16 – Viewpoint 14: Daytime and night-time photos

15

Viewpoint 15

Description of existing day-time view

Viewpoint 15 is located outside third building of the Cotton field wharf. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was dry and cloudy during the Proposed Development visit. The area appeared private and moderately busy.

View to the North: Viewing to the north, the New Islington Marina which continues to the Rochdale Canal Towpath, and across it are the viewpoints 16-21 located. These buildings are the main receptors for the Proposed Development. The street/public pathway is lit by wall-mounted floodlights which are mounted on the façade wall of the viewpoints 16-21.

View to the East: Viewing to the east, there is a seven-floor + roof top residential building. The ground floor features a restaurant, while the upper floors consist of residential apartments. The Proposed Development is visible from the first through seven floors + roof top of the building. The cotton field wharf are the three connected buildings.

View to the West: The Proposed Development is visible from the first to seven floors + roof top of the residential buildings. Key landmarks like New Islington Marina, New Ancoats Primary Care Centre, Co-op Academy New Islington and Cotton Field Park can also be seen. Additionally, 6m high trees provide some screening.

View to the South: Viewing to the south, there is a viewpoint 10-14 which is describe in above section.

Description of the existing night-time view

The external lighting at this viewpoint provides sufficient illumination, particularly for the busy New Islington Marina Prom. The area features 10m LED columns with a 4000K colour temperature. From Viewpoint 15, the scene resembles a public realm, restricted to pedestrians and cyclists, with no vehicle access. The primary light source is from the lighting columns, with no noticeable glare. Light spill from the columns is faint, while skyglow is visible due to the Site's location and the viewpoint.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	4.17lx
North (at 1.5m)	2.99lx
East (at 1.5m)	4.37lx
South (at 1.5m)	12.99lx
West (at 1.5m)	1.92lx



View to the West – Daytime



View to the West – Night-time

Figure 5-17 – Viewpoint 15: Daytime and night-time photos

16

Viewpoint 16

Description of existing day-time view

Viewpoint 16 is located beside Radium Street. The building is Flint Glass Wharf. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was dry and cloudy during the visit. The area appeared moderately busy, featuring a mix of heritage buildings and modern architecture.

View to the North: The Flint Glass Wharf is a mixed-use building with five floors. The ground floor houses commercial shops, while the upper floors are residential. These upper floors are likely to have a clear view of the Proposed Development.

View to the East: Viewing to the east, is the Union Street Bridge, with the rear of Viewpoint 15, a residential building, located across it. This area marks the junction with Redhill Street, which extends westward to Viewpoint 17-21, the primary receptor. New Union Street continues eastward from the junction.

View to the West: Viewing to the west is Redhill Street, which leads directly to Viewpoint 17-21, the primary receptors for the Proposed Development.

View to the South: Viewing to the south, is the Proposed Development, clearly visible from the upper floors of nearby buildings. The lower floors are screened by the Co-op Academy New Islington.

Description of the existing night-time view

The external lighting at this viewpoint provides adequate illumination, especially for the busy junction of Union Street Bridge, Redhill Street, and New Union Street. The area is lit by 10m LED columns with a 4000K colour temperature. From Viewpoint 16, the scene reflects that of a moderately traffic road, frequented by motorists, pedestrians, and cyclists. The primary light source is the street lighting, which produces no significant glare. There is minimal light spill from the columns, though skyglow is present due to the Site's location and the nature of the viewpoint.

Lighting measurements (16th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	4.59lx
North (at 1.5m)	1.56lx
East (at 1.5m)	2.18lx
South (at 1.5m)	4.15lx
West (at 1.5m)	5.08lx



View to the South – Daytime



View to the South – Night-time

Figure 5-18 – Viewpoint 16: Daytime and night-time photos

17	**Viewpoint 17** **Description of existing day-time view** Viewpoint 17 is located outside Royal Mill. The building is Heritage building. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was rainy and cloudy during the visit. The area appeared moderately busy, featuring a mix of heritage buildings and modern architecture. **View to the North:** Viewing to north, is the residential building which has seven floors. The ground and first floor have the obstructed view to the Proposed Development. The upper floors are likely to have a clear view of the Proposed Development. **View to the East:** Viewing to the east, is the Union Street Bridge, with the rear and side view of Viewpoint 15, a residential building, located across it. This area marks the junction with Redhill Street, which extends westward to Viewpoint 18-21, the primary receptor. The Redhill Street continues westward from the junction. **View to the West:** Viewing to the west is Redhill Street, which leads directly to Viewpoint 18-21, the primary receptors for the Proposed Development. **View to the South:** Viewing to the south, is the Proposed Development, clearly visible from the upper floors of the residential buildings. The ground floor and first floor are screened by the approx. 6m high trees. **Description of the existing night-time view** The external lighting at this viewpoint provides adequate illumination, especially for the busy junction of Union Street Bridge, Redhill Street, and New Union Street. The area is lit by 10m LED columns with a 4000K colour temperature. There is wall mounted floodlight on the façade of the building and the scene reflects that of a moderately trafficked road, frequented by motorists, pedestrians, and cyclists. The primary light source is the street lighting, which produces no significant glare. There is minimal light spill from the columns, though skyglow is present due to the Site's location and the nature of the viewpoint.

Lighting measurements (16th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	5.15lx
North (at 1.5m)	4.97lx
East (at 1.5m)	3.05lx
South (at 1.5m)	5.96lx
West (at 1.5m)	3.42lx



View to the South – Daytime



View to the South – Night-time

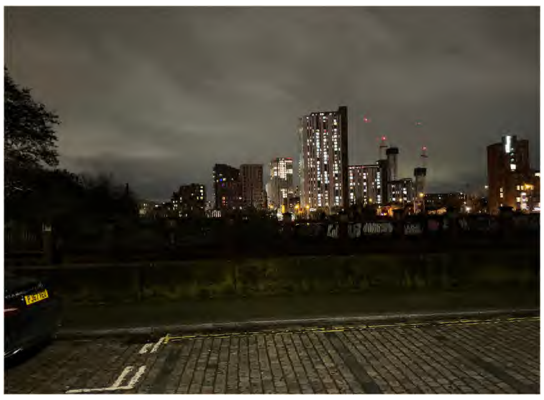
Figure 5-19 – Viewpoint 17: Daytime and night-time photos

18 - 19	**Viewpoint 18/19** **Description of existing day-time view** Viewpoint 18-19 are located outside Royal Mill. These building are Murray and Sedgwill Mill buildings. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was rainy and cloudy during the visit. The area appeared moderately busy, featuring a mix of heritage buildings and modern architecture. **View to the North:** Viewing to north, these are residential buildings which has seven floors. The ground and first floor have the obstructed view to the Proposed Development. The upper floors are likely to have a clear view of the Proposed Development. **View to the East:** Viewing to the east, is the Redhill street which meets Union Street Bridge. This area marks the junction with Redhill Street, which extends westward to Viewpoints 20 and 21, the primary receptor. The Redhill Street continues westward from the junction. **View to the West:** Viewing to the west is Redhill Street, which leads directly to Viewpoint 20 and 21, the primary receptors for the Proposed Development. **View to the South:** Viewing to the south, is the Proposed Development, clearly visible from all the floors of the residential buildings. The ground floor and first floor are screened by the approx. 6m high trees. **Description of the existing night-time view** The external lighting at this viewpoint provides adequate illumination, especially for the busy junction of Union Street Bridge, Redhill Street, and New Union Street. The area is lit by 10m LED columns with a 4000K colour temperature. There is wall mounted floodlight on the façade of the building and the scene reflects that of a moderately trafficked road, frequented by motorists, pedestrians, and cyclists. The primary light source is the street lighting, which produces no significant glare. There is minimal light spill from the columns, though skyglow is present due to the Site's location and the nature of the viewpoint.

Lighting measurements (16th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	16.45lx
North (at 1.5m)	3.61lx
East (at 1.5m)	3.91lx
South (at 1.5m)	7.04lx
West (at 1.5m)	3.07lx



View to the South – Daytime



View to the South – Night-time

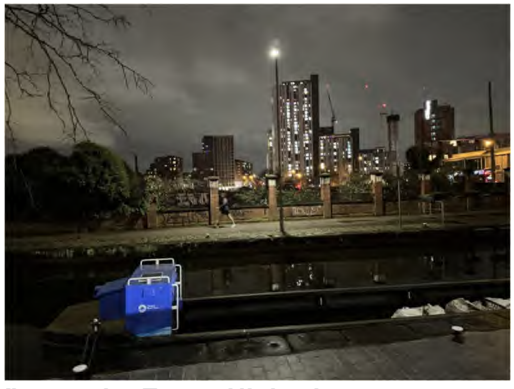
Figure 5-20 – Viewpoint 18-19: Daytime and night-time photos

20	**Viewpoint 20** **Description of existing day-time view** Viewpoint 20 is located beside Pickford street. This is a 5-floor residential cum commercial building. The ground floor has shops and first to fourth floor has residential flats. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was rainy and cloudy during the visit. The area appeared moderately busy, featuring a mix of heritage buildings and modern architecture. **View to the North:** Viewing to the north, is the Redhill street which meets Union Street Bridge. This area marks the junction with Redhill Street, which extends westward to Viewpoint 21, the primary receptor. The Redhill Street continues westward from the junction. **View to the East:** Viewing to the east, is the Proposed Development, clearly visible from all the floors of the residential buildings. The ground floor and first floor are screened by the approx. 6m high trees. **View to the West:** Viewing to west, this is residential buildings which has ground to four floors. The ground floor has the obstructed view to the Proposed Development. The upper floors are likely to have a clear view of the Proposed Development. **View to the South:** Viewing to the south is Redhill Street, which leads directly to Viewpoint 21, the primary receptors for the Proposed Development. **Description of the existing night-time view** The external lighting at this viewpoint provides adequate illumination, especially for the busy junction of Union Street Bridge, Redhill Street, and New Union Street. The area is lit by 10m LED columns with a 4000K colour temperature. There is wall mounted floodlight on the façade of the building and the scene reflects that of a moderately trafficked road, frequented by motorists, pedestrians, and cyclists. The primary light source is the street lighting, which produces no significant glare. There is minimal light spill from the columns, though skyglow is present due to the Site's location and the nature of the viewpoint.

Lighting measurements (16th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	8.16lx
North (at 1.5m)	2.61lx
East (at 1.5m)	1.59lx
South (at 1.5m)	3.06lx
West (at 1.5m)	2.87lx

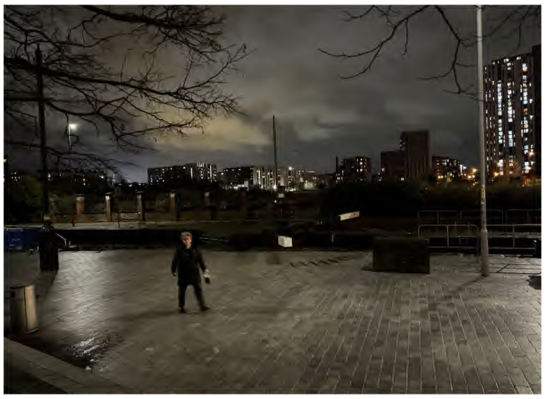


View to the East – Daytime



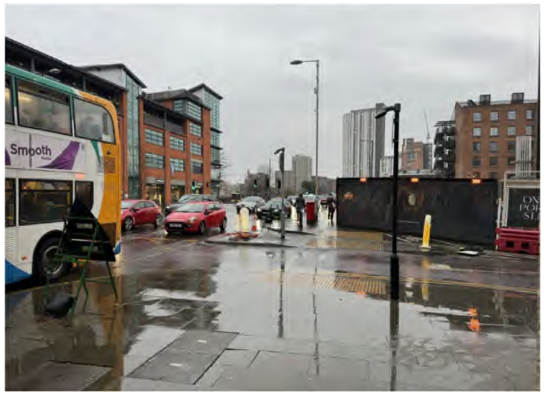
View to the East – Night-time

Figure 5-21 – Viewpoint 20: Daytime and night-time photos

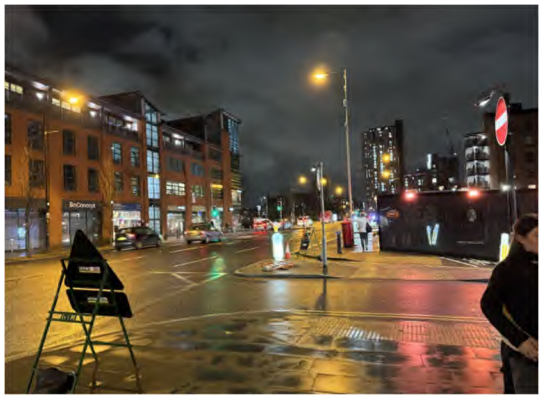
21	**Viewpoint 21** **Description of existing day-time view** Viewpoint 21 is located beside Pickford street. This is a 5-floor residential cum commercial building. The ground floor has shops and first to floor has residential flats. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was rainy and cloudy during the visit. The area appeared moderately busy, featuring a mix of heritage buildings and modern architecture. **View to the North:** Viewing to the north, is the Redhill street which meets Union Street Bridge. This area marks the junction with Redhill Street, which extends southward to Great Ancoats Street, and across the street is the primary receptor. The Redhill Street continues northward from the junction. **View to the East:** Viewing to the east, is the Proposed Development, clearly visible from all the floors of the residential buildings. The ground floor and first floor are screened by the approx. 6m high trees. **View to the West:** Viewing to west, this is residential buildings which has ground and four floors. The ground floor has the obstructed view to the Proposed Development. The upper floors are likely to have a clear view of the Proposed Development. **View to the South:** Viewing to the south is Great Ancoats Street, and across the street is the primary receptor. **Description of the existing night-time view** The external lighting at this viewpoint provides adequate illumination, especially for the busy junction of Union Street Bridge, Redhill Street, New Union Street and Great Ancoats. The area is lit by 10m LED columns with a 4000K colour temperature. There is wall mounted floodlight on the façade of the building and the scene reflects that of a moderately trafficked road, frequented by motorists, pedestrians, and cyclists. The primary light source is the street lighting, which produces no significant glare. There is minimal light spill from the columns, though skyglow is present due to the Site's location and the nature of the viewpoint. **Lighting measurements (16th February 2024)** **Direction of sensor** — **Light reading in Lux** **Ground (Horizontal Illuminance – Lux)** — 2.52lx **North (at 1.5m)** — 3.83lx **East (at 1.5m)** — 3.43lx **South (at 1.5m)** — 4.18lx **West (at 1.5m)** — 4.37lx  **View to the East – Daytime**  **View to the East – Night-time** **Figure 5-22 – Viewpoint 21: Daytime and night-time photos**

22	**Viewpoint 22** **Description of existing day-time view** Viewpoint 22 are located beside Port Street. This is the 11-floor residential building with ground floor having commercial units. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was rainy and cloudy during the visit. The area appeared very busy. **View to the North:** Viewing to north, the Great Ancoats street passes from east to west and across there are residential and commercial buildings. **View to the East:** Viewing to the south, is the Proposed Development, clearly visible from all the upper floors of the buildings. The ground floor has the commercial units which has no lighting impact. **View to the West:** Viewing to the west is the 11-floor residential building which has large French windows and has the clear view of the Proposed Development. **View to the South:** Viewing to north, the Port Street passes which has residential buildings; however, these buildings are out of line of sight to the Proposed Development. **Description of the existing night-time view** The external lighting at this viewpoint provides adequate illumination, especially for the busy junction of Great Ancoats Street. The area is lit by 10m to 12m LED columns with a 4000K colour temperature. The primary light source is the street lighting, which produces no significant glare. There is minimal light spill from the columns, though skyglow is present due to the Site's location and the nature of the viewpoint.

Lighting measurements (16th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	7.56lx
North (at 1.5m)	6.81lx
East (at 1.5m)	10.34lx
South (at 1.5m)	9.47lx
West (at 1.5m)	5.55lx



View to the East – Daytime



View to the East – Night-time

Figure 5-23 – Viewpoint 22: Daytime and night-time photos

23	**Viewpoint 23** **Description of existing day-time view** Viewpoint 23 are located beside Port Street. This is the 11-floor residential building with ground floor having commercial units. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was rainy and cloudy during the visit. The area appeared very busy. **View to the North:** Viewing to north, the Great Ancoats street passes from east to west and across there are residential and commercial buildings. **View to the East:** Viewing to the east, is the Proposed Development, clearly visible from all the upper floors of the buildings. The ground floor has the commercial units which has no lighting impact. **View to the West:** Viewing to the west is the 11-floor residential building which has large French windows and has the clear view of the Proposed Development. **View to the South:** Viewing to south, the Port Street passes which has residential buildings; however, these buildings are out of line of sight to the Proposed Development. **Description of the existing night-time view** The external lighting at this viewpoint provides adequate illumination, especially for the busy junction of Great Ancoats Street. The area is lit by 10m to 12m LED columns with a 4000K colour temperature. The primary light source is the street lighting, which produces no significant glare. There is minimal light spill from the columns, though skyglow is present due to the Site's location and the nature of the viewpoint.

Lighting measurements (16th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	37.94lx
North (at 1.5m)	36.1lx
East (at 1.5m)	17.84lx
South (at 1.5m)	12.54lx
West (at 1.5m)	35.34lx



View to the East – Daytime



View to the East – Night-time

Figure 5-24 – Viewpoint 23: Daytime and night-time photos

24	**Viewpoint 24** **Description of existing day-time view** Viewpoint 24 is located next to the parking entrance of the commercial outlet (ALDI and M&S). This viewpoint is considered due to the residential building behind which acts as a primary receptor. The area falls within Environmental Zone E3, indicating medium district brightness. The weather was rainy and cloudy during the visit. The area appeared moderately busy due to the Great Ancoats Street passing from North to South. **View to the North:** Viewing to north, the Great Ancoats street passes from east to west and across there are residential and commercial buildings. **View to the East:** Viewing to the east, is the Proposed Development, clearly visible from all the floors of the buildings. **View to the West:** Viewing to the west is the 7-floor residential building which has the clear view of the Proposed Development. **View to the South:** Viewing to the south, there is a commercial outlet (ALDI. M&S) which has no lighting impact due to the operational hours. **Description of the existing night-time view** The external lighting at this viewpoint provides adequate illumination, especially for the busy junction of Great Ancoats Street. The area is lit by 10m to 12m LED columns with a 4000K colour temperature. The primary light source is the street lighting, which produces no significant glare. There is minimal light spill from the columns, though skyglow is present due to the Site's location and the nature of the viewpoint.

Lighting measurements (15th February 2024)	
Direction of sensor	**Light reading in Lux**
Ground (Horizontal Illuminance – Lux)	25.14lx
North (at 1.5m)	11.24lx
East (at 1.5m)	9.31lx
South (at 1.5m)	7.26lx
West (at 1.5m)	8.31lx



View to the East – Daytime



View to the East – Night-time

Figure 5-25 – Viewpoint 24: Daytime and night-time photos

6. Environmental considerations

6.1. Summary of the ES Biodiversity chapter[2]

6.1.1. Find below a summary including expert from the PEA associated with the Proposed Development.

6.1.2. The Conservation of Habitats and Species Regulations 2017 (as amended) (the Habitats Regulations)

The Habitats Regulations transpose into UK law the Habitats Directive (Council Directive 92/43/EEC) and the Wild Birds Directive (Directive 2009/147/EC), i.e. the Nature Directives). The Habitats Regulations offer protection to a number of plant and animal species via the designation of Special Areas of Conservation (SAC) and Special Protection Areas (SPA). The Regulations also offer protection to a number of 'European Protected Species' (EPS). The Habitats Regulations were amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 in light of the UK's withdrawal from the European Union. The amendment does not make any substantive changes to the protection of SACs, SPAs or species classed as EPS as protected under the Habitats Regulations. It does however change the nomenclature of the protected sites network within the UK. The Natura 2000 site network, comprising SPAs, SACs and Ramsar sites is now titled the National Sites Network within the UK. The National Sites Network does not include Ramsar sites; however, it is noted that many Ramsar sites overlap with SAC and SPA sites and all Ramsar sites continue to be protected in the same way as SACs and SPAs.

6.1.3. Wildlife & Countryside Act (WCA) 1981 (as amended)

The Act consolidates and amends existing national legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Wild Birds Directive in Great Britain. The Act gives protection to: Wild birds (including special protection from disturbance for birds listed on Schedule 1 of the Act). Wild animals listed on Schedule 5 of the Act. Wild plants listed on Schedule 8 of the Act. The Act contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9 of the Act. The Act provides for the notification and confirmation of Sites of Special Scientific Interest (SSSIs) – these sites are identified for their flora, fauna, geological or physiographical features. The Act also contains measures for the protection and management of SSSIs. The Act provides for the declaration of National Nature Reserves (NNRs) by the statutory country conservation agencies. NNRs contain examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats or to provide special opportunities for scientific study of the habitats communities and species represented within them.

6.1.4. The Greater Manchester Biodiversity Action Plan (GM BAP)

The overall aim of the GM BAP is "To promote the conservation, protection and enhancement of biological diversity in Greater Manchester for current and future generations". Habitat Action Plans included in the GM BAP are:

[2] ES (Volume 2) Chapter 8: Biodiversity

- Grasslands
- Hedgerows
- Lowland moss lands
- Reedbeds and bittern
- Ponds and lodges
- Canals
- Native woodlands
- Uplands
- Urban managed greenspace
- Species Action Plans included in the GM BAP are:
- Bats
- Black redstart
- Farmland birds
- Great crested newts
- Hares
- Native black popular
- Twite
- Water vole
- Willow tit

6.1.5. *A desk study and walkover survey were conducted to assess the ecological value of the Site and its potential impact on protected and priority species. The following summarizes the findings:*

Badgers: No badger setts or signs were identified within or near the Site, and the habitat is unsuitable due to hardstanding surfaces and urban barriers. As badgers are not present, they are not expected to be affected by any lighting impacts and are excluded from further consideration.

Amphibians: No amphibians or suitable habitats were identified within the Site or surrounding area, and the urban environment with poor habitat connectivity (e.g., concrete canal edges) further reduces the likelihood of their presence. Amphibians are not considered vulnerable to lighting impacts within this area.

Bats: Despite 70 bat records within 2 km, the Site itself provides limited habitat for foraging and commuting due to high levels of artificial lighting and urbanization. The surrounding area, including the canal, may serve as commuting corridors for widespread bat species, such as the common and soprano pipistrelle, but the Site is of low roosting suitability. Precautionary measures regarding lighting are recommended to minimize impacts on bat activity in adjacent areas, as bats are sensitive to light pollution, which could disrupt their nocturnal foraging and commuting behaviours.

Birds: Sixty-five priority bird species were recorded in the vicinity, but the Site itself offers limited nesting opportunities due to the dominance of hardstanding surfaces and sparse vegetation. Widespread urban bird species, such as blackbirds and woodpigeons, may use the Site, but artificial lighting is unlikely to significantly affect their nesting or foraging behaviours given their adaptation to urban environments.

Reptiles: The absence of suitable habitats and records of reptiles within the Site indicates that they are unlikely to be impacted by lighting conditions. The urban environment is unsuitable for reptile populations.

Otter and Water Vole: While the adjacent Rochdale Canal may serve as a commuting route for otters and water voles, the concrete banks and lack of vegetation make the Site unsuitable for resting or breeding. Any lighting installed near the canal should minimize spillover to avoid disrupting their natural behaviours, although they are considered of low importance in this context.

Priority Invertebrates, Plants, and Mammals: Limited records of priority invertebrates, plants, and mammals, such as hedgehogs, were found, with the Site offering little suitable habitat. Artificial lighting is not expected to significantly impact these species due to the absence of conducive environments.

Non-native Invasive Plant Species: No invasive species of legal concern were identified in the desk study, though some species, such as wall cotoneaster and butterfly-bush, were observed during the survey.

6.2. Ecological / visual / energy considerations

6.2.1. Any additional lighting introduced into the environment will have an impact, ensuring the Proposed Development does not have a significant and lasting impact on the surrounding environment is of high importance.

6.2.2. It should be noted that the existing Site layout and the general ambient conditions (currently lit) of the environs are analogous with environmental zone of E3.

6.2.3. There are various environmental considerations that need to be taken into account when considering the existing installation of exterior lighting. These are the direct energy usage, the visual impact of the lighting equipment during the day, the effect of light spillage on surrounding areas, the spill of light into the night sky, and the effects on human receptors, wildlife habitats including animals, plant life and surrounding landscape. These factors will vary depending on the location of the proposed lighting installation and can also vary within the Proposed Development.

6.2.4. The proposed lighting levels should not exceed 1 lux on both vertical and horizontal plane as a general environmental requirement around the identified receptors. This is in line with Bat Conservation Trust, ILP GN08/23 and can also be equated to twilight levels, a criterion used for obtrusive light assessments. Refer to next paragraph for further illustration.

6.2.5. Typical lunar illuminance is up to 0.1 lux i.e., the intensity of moonlight varies greatly depending on the lunar phase, but even the full Moon typically provides only about 0.25 to <1 lux illumination. Refer to Figure 6-1 for typical lux level for reference (taken from superseded ILP GN 08/18). It is worth noting that this table has now been removed from GN08/23.

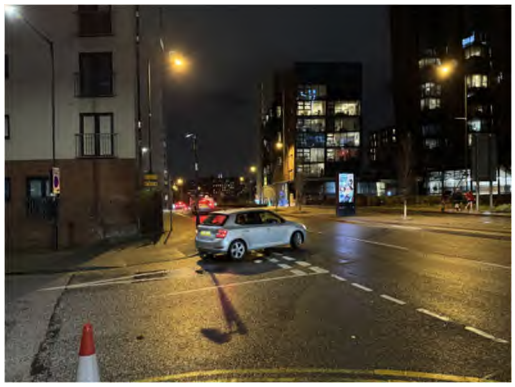
Chart of example lux levels for reference			
Lighting conditions	**Lux level**	**Lighting conditions**	**Lux level**
British summer sunshine	50,000	Typical side road lighting	5
Overcast sky	5,000	Minimum security lighting	2
Well-lit office	500	Twilight	1
Minimum for easy reading	300	Clear full moon	0.25 to <1
Passageway or outside working area	50	Typical moonlight/cloudy sky	0.1
Good main road lighting	5-20	Typical starlight	0.001
Sunset	10	Poor starlight	0.0001

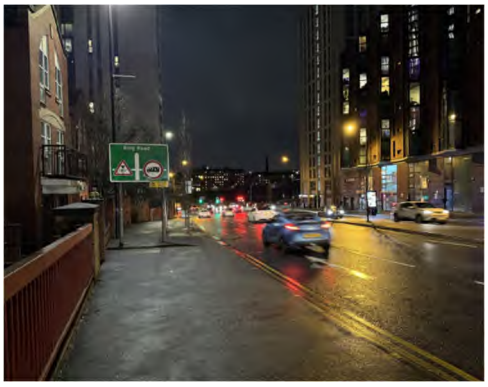
Source: IPCCTV specialists use-IP Ltd

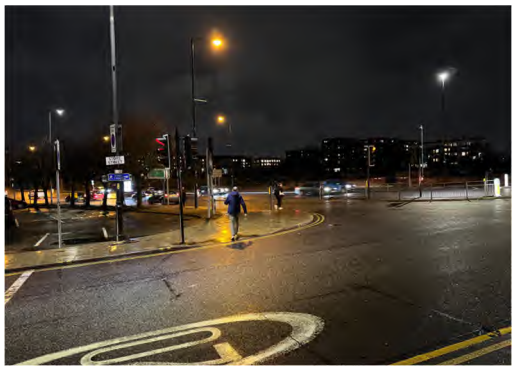
Figure 6-1 – Chart example illuminance levels for reference (taken from ILP GN 08/18)

6.2.6. The Proposed lighting system would be assessed to ensure it is currently and continue to be sustainable with energy efficient and minimal environmental impact (visual and ecological). Section 7 covers the proposed lighting installation strategy and design of the Proposed Development.

6.2.7. Refer to Figure 6-2, nighttime photos showing the existing ambient conditions in and around the Proposed Development.







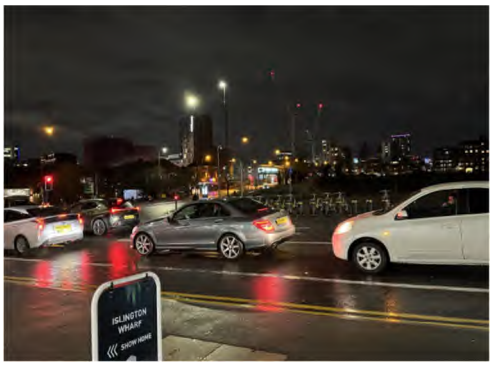




Figure 6-2 – Existing ambient lighting conditions on the Proposed Development

7. Proposed lighting strategy

7.1.1. This section outlines the proposed lighting strategy for the MDC Site, focusing on the public realm and façade lighting around the North and South buildings. The strategy aims to provide a safe and aesthetically pleasing environment during night-time hours, ensuring compliance with local and international lighting standards while mitigating environmental impacts.

7.2. Scope of lighting

7.2.1. The lighting design for the Proposed Development encompasses the following elements:

- **Facade lighting for North and South buildings :** The external facades of the buildings will be illuminated with uplighters to enhance architectural features, providing both functional illumination and aesthetic enhancement. The luminaires will be positioned to minimize light spill and direct the light only toward the building surfaces, creating a balanced and visually appealing night-time appearance.
- **Tree pplighting:** Surrounding trees will be up lighted to emphasize the landscape and natural beauty of the Site. Warm-coloured, low-intensity luminaires will be used to avoid excessive light pollution, creating a soft glow that complements the architecture.
- **Boulevard feature lighting:** The boulevard situated between the North and South building will feature LED linear and circular uplighting and/or integrated lighting elements along the pathway. This feature lighting will enhance the visual identity of the boulevard while ensuring safe and adequate lighting levels for pedestrians.
- **Architectural and pedestrian area lighting:** Lighting columns (functional and feature) will be placed along public walkways and pedestrian zones to ensure uniform light distribution. These columns will include glare-control measures and be spaced to avoid shadows or dark areas, ensuring both safety and comfort.

7.3. Lighting levels and operational considerations

7.3.1. The proposed lighting system is designed to achieve optimal lighting levels, ensuring safety, comfort, and environmental responsibility. The key operational considerations are as follows:

- **Adequate illumination for safety:** Lighting levels across the facade, public walkways, and boulevard are selected to ensure adequate illumination for safety and visibility. The design

considers the needs of pedestrians and building users while avoiding excessive brightness that could cause discomfort or create glare.

- **Minimizing obtrusive lighting:** Lighting calculations show that lux levels on vertical surfaces near residential receptors are kept below 1 lux, preventing any obtrusive light from affecting local residents. This minimizes potential light spill and glare in adjacent residential areas.
- **Energy efficiency:** The lighting design prioritizes energy-efficient LED luminaires, which reduce power consumption and align with sustainability goals. Smart lighting controls, such as motion sensors and timers, will be implemented to further enhance energy conservation.
- **Ecological impact:** To protect the local ecosystem, low-wavelength, warm lighting will be used to minimize disruptions to fauna and flora. This helps ensure that nocturnal wildlife is not adversely affected by the lighting infrastructure, maintaining ecological balance.

7.4. General good practice

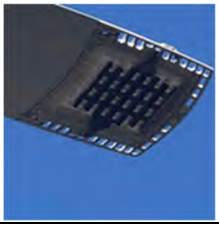
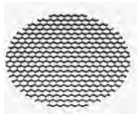
7.4.1. The selection of equipment is critical to controlling light distribution and reducing the installation's impact on the surrounding environment. Good quality equipment should be propose that restricts light to the areas required and does not contribute to excessive levels of spill, intensity, or upward output.

7.4.2. In general equipment provided should:

- Eliminates light output above the horizontal.
- Demonstrates good output control, to limit distribution to the areas requiring illumination.
- Can be easily fitted with shields, louvre, cowls, hood, or baffles.

7.4.3. Refer to Table 7-1 for Illustration and description of viable and sustainable lighting equipment and accessories for limiting obtrusive light.

Table 7-1 – Viable and non-viable lighting equipment for limiting obtrusive light

Acceptable lighting equipment and accessories		Unacceptable lighting equipment and accessories	
	Example of a good LED flat glass, full cut-off luminaire with good optical control. For column mounting		Example of old Lamp technology with poor optical control and luminaire tilted.
	Example of a good LED flat glass, full cut-off luminaire with good optical control and custom shield. For column mounting		Example of a poorly shielded luminaire that will still produce upward light. Replacement is a better option.
 	Example of a good floodlight with micro louvre to reduce glare and ULR		Example of poorly installed and aimed floodlights

	Example of a good LED in-ground uplight with louvres to reduce glare		Example of extreme source intensity glare from poorly installed uplight luminaires
Luminaire accessories for limiting obtrusive light.			
	Luminaire with Cowl, Hood, and Shield		
	Luminaire with Louvre		
	Luminaire with Cowl		

7.4.4. All lighting should be designed under the most efficient principles practicable, Right light at the Right time in the Right place. This means:

- Right Light: Look to the correct application of the lighting standards, defining the required lighting levels dependent on the task being undertaken and the level of activity and risk. Right light refers to the correct selection of light source, with due consideration of the most energy efficient modern sources, such as LED. Balanced against these requirements is the need to consider the impact of lighting on local sensitive flora and fauna, especially bats.
- Right Time: The lighting standards permit levels to be adjusted dependent on the use of an area, such as when traffic or pedestrian activity falls. Lowering levels to the minimum required for safety and security, or even full switch-off regimes, may be considered at certain times. Such an approach may be across the Proposed Development or suitably zoned.
- Right Place: Ensure that only the areas required are illuminated. Reductions in spill and obtrusive light to at least the constraints imposed by the applicable Environmental Zone should be achieved, through the careful consideration of luminaires and how they are installed.
- Right System: The most energy efficient lighting installations require a suitable control system such as Central Management System (CMS), use of PIR Sensor among others. Dependent on the operator and operating regime, a system that allows monitoring and control including variable lighting regime may be considered.
- Exterior lighting design and equipment should conform to the adoption criteria of the asset owner/maintainer, whilst ensuring compliance with the constraints of the Environmental Zone.

7.4.5. If obtrusive lighting is identified post construction of the development, luminaires can be fitted with luminaire accessories such as shields to reduce the impact.

Technical considerations

Luminaires

7.4.6. LED technology offers greater optical control compared to traditional lamp light sources, with the potential to minimise all forms of obtrusive light. Proposed luminaires should comply with glare rating of G4 to G6 Luminous Intensity Class contained in BS EN 13201-2:2015, Road Lighting Performance requirements (Table A.1-Luminous intensity class, Annexe A), resulting in no direct upward light output. Consideration should be given to luminaire tilt as this impact on glare rating.

7.4.7. It is important to consider the luminaire, its light distribution, how it is installed and set up as these factors plays a significant role on how light is propagating into the atmosphere and therefore dispersed back towards the observer on ground and resulting into skyglow or glare effect if not properly controlled.

Colour temperature

7.4.8. All light sources have an associated colour temperature. This is a measure of how cool or warm the colour appears when viewed and is measured in Kelvin. Lighting which appears warm – hints of red, orange, or amber – has a lower colour temperature, usually from around 1,800K to 2,000K. As the colour temperature increases the light appears to become more neutral, ~3000K to 4000K. Finally, the light will begin to take on a blue tinge and appear cooler; these colour temperatures are in the region of 5000K and above. Refer to Figure 7-1 for Colour Temperature Appearance.



Figure 7-1 – Colour Temperature Appearance (1000K to 10000K)

7.4.9. Generally, the higher the colour temperature the bluer light (shorter wavelength) is present in the distribution. The amount of power emitted at each wavelength by a light source is known as the spectral power distribution and is discussed in more detail in Section 7.3.9.

7.4.10. It is generally preferable to use warmer light sources between 3000 - 3000K colour temperature when trying to limit short wavelength (‘blue’) output, to create a more comfortable environment for humans, bats, flora and fauna and an acceptable installation ecologically. While cooler

sources have generally been more efficient, advances in technology have reduced the discrepancy.

Column heights

7.4.11. In general, all lighting columns provided for the task lighting should be in keeping with the surrounding environment and the heights of adjacent buildings. Lower mounting height can be worse as it creates a higher level of light spill and require additional lighting points.

7.4.12. Glare can be reduced by ensuring that the main beam angle of the proposed luminaires directed towards any potential observer or receptor is no greater than 70°. Higher mounting heights allow lower main beam angles, which can assist glare reduction.

7.5. Proposed lighting design and analysis

7.5.1. The proposed lighting design has been based on detailed analysis to implement both operational effectiveness and environmental responsibility. Key elements of the design and the accompanying analysis include:

7.5.2. **Facade and tree uplighting:** Uplighting the facades of the North and South buildings, as well as the surrounding trees, to create a visually appealing atmosphere, highlighting both natural and architectural features. The design considered the precise positioning of lighting units to ensure that light is directed appropriately, avoiding unnecessary sky glow or obtrusive effects on neighbouring areas.

7.5.3. **Lighting levels and calculations:** Detailed lighting calculations were conducted to ensure that the proposed system meets required lux levels without exceeding environmental limits. The analysis showed that all lighting areas have sufficient illumination to ensure safety and visibility, while lux levels at residential receptors remained under the acceptable threshold of 1 lux.

7.5.4. **Boulevard and pedestrian lighting:** The feature lighting along the boulevard and the pedestrian areas has been designed to provide safe navigation and create a dynamic visual experience. The lighting has been integrated into the landscape with lighting units that blend into the environment while maintaining a clear and welcoming pathway for users.

7.5.5. **Obtrusive light assessment:** The lighting strategy includes an assessment of potential impacts on the local ecosystem, particularly with regard to nocturnal wildlife. The proposed design minimizes intrusion into natural habitats through the use of controlled lighting, ensuring that the impact on local flora and fauna is negligible.

7.5.6. Lighting installations have been designed by competent designers and in accordance with publications listed in this document, as well as other industry and Site-specific documents dealing with lighting.

7.5.7. Pertinent standards and guidance include:

- BS EN 12464-2:2014 Light and lighting – Lighting of workplaces – Part 2: Outdoor workplaces (BSI, 2014).
- BS 5489-1:2020 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas (BSI, 2020).
- BS EN 13201 (all parts) Road lighting (BSI, 2014,2015).
- Document listed in Section 3.5 of this report.

7.5.8. Type of area, task or activity to be lit is summarised in Table 7-2

Table 7-2 – Type of Area, Task or Activity to be lit.

Type of area, task, or activity	Proposed lighting
Pedestrian Walkways and Public Realm Area	▪ Architectural Lighting Columns to be installed approx. 4m high. ▪ Inground tree uplight to light the trees. ▪ Wall mounted luminaire to illuminate the Façade of Proposed Development
Access Road	▪ Proposed 4m height with post top lighting unit

7.5.9. Refer Figure 7-2 for the illumination criteria taken from Table 5.1 — General requirements for areas and for cleaning at outdoor workplaces.

7.5.10. Expected lighting levels are contained within the red rectangular shape.

7.5.11. This illumination criteria are to be read in conjunction with Table 7-3 that comprises of the indicative lighting levels achieved.

Table 5.1 — General requirements for areas and for cleaning at outdoor work places

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx	U_o –	R_{GL} –	R_a –	Specific requirements
5.1.1	Walkways exclusively for pedestrians	5	0,25	50	20	
5.1.2	Traffic areas for slowly moving vehicles (max. 10 km/h), e.g. bicycles, trucks and excavators	10	0,40	50	20	
5.1.3	Regular vehicle traffic (max. 40 km/h)	20	0,40	45	20	At shipyards and in docks, R_{GL} may be 50
5.1.4	Pedestrian passages, vehicle turning, loading and unloading points	50	0,40	50	20	
5.1.5	Cleaning and servicing	50	0,25	50	20	All relevant surfaces

Figure 7-2 – Illumination Criteria

7.6. Maintenance factor calculation

7.6.1. The overall maintenance factor (MF) for the proposed luminaire has been determined as follows.

MF = LLMF X LSF X LMF

- LLMF – Lamp Lumen Maintenance Factor
- LMF – Luminaire Maintenance Factor
- LSF – Lamp Survival Factor
- MF – Overall Maintenance Factor

7.6.2. MF Data source (The proposed lighting units have same maintenance factor based on (L90B10 > 100000h)

- LLMF – Based on the Manufacturer Datasheet and lifetime Ta=25° L90B10 > 100000h
- LMF – Based on 36 months cleaning cycle.
- LSF - Taken to be 1 as per Annex D contained in BS5489-1:2020

7.6.3. Calculated Overall maintenance factor for proposed luminaire

- LLMF – 0.9
- LMF – 0.83
- LSF – 1
- MF = 0.9X0.83X1
- MF = 0.74

7.7. Typical lighting calculation

7.7.1. An indicative lighting calculation has been produced for all aspects of the lighting provision.

7.7.2. The level of light shown in the calculation study demonstrate very low significance of obtrusive light in the form of light spill and intrusion around the Proposed Development and environs. The lighting will have no impact to the ecology and the environs.

7.7.3. Further to the modelling of the Proposed Development and the existing surrounding area (residential buildings), situations and lighting calculation analysis, the outcome of the result showed that no impact on the identified receptors.

7.7.4. For the purpose of this assessment, limits for the luminous intensity of luminaires and limitation of skyglow has been considered bearing in mind possible maximum values indicated in GN01/21 (Refer to Appendix A).

7.7.5. The current design has been assessed to account for all obtrusive lighting criteria as defined in GN01/21.

Table 7-3 – Indicative Lighting Levels Achieved

Location	BS12464-2 Ref. no	Type of area, task, or activity	E_{avg} lx	E_{min} lx	Uo	Commentary
Front of House Public Realm Area	5.1.1	Walkways exclusively for pedestrians	8.2lx	1.4lx	0.26	Illuminance levels comply with BS 12464 – 2: 2014
Back of house Emergency Access Road	5.1.2	Traffic areas for slow moving vehicles (max. 10km/h), e.g. bicycles, trucks and excavators	11lx	1.9lx	0.42	Illuminance levels comply with BS 12464 – 2: 2014

7.8. Evaluation of illuminance levels achieved

7.8.1. Indicative heat map (horizontal illuminance) and lighting levels achieved within the Proposed Development is indicated in Figure 7-3 to Figure 7-11. Calculation has incorporated lighting contribution from façade lighting, lighting for walkways for pedestrians, lighting access road. The horizontal illuminance for the front of house public realm area and horizontal illuminance for emergency access road used by the vehicles are taken into consideration for this lighting calculation study.

7.8.2. The vertical illuminance is carried out for 24 residential receptors which are adjacent to the Proposed Development, and the calculation study shows that the lux levels for each receptor is below 1lux. 1 lux equates to twilight as indicated in Figure 6-1 taken form ILP GN08/18 which gives an indication of lux level reference.

7.8.3. The vertical plane for each viewpoint has been set as calculation grid up to 30m height from ground level. It is assumed that most of the buildings in the environ are in excess of 15m height.

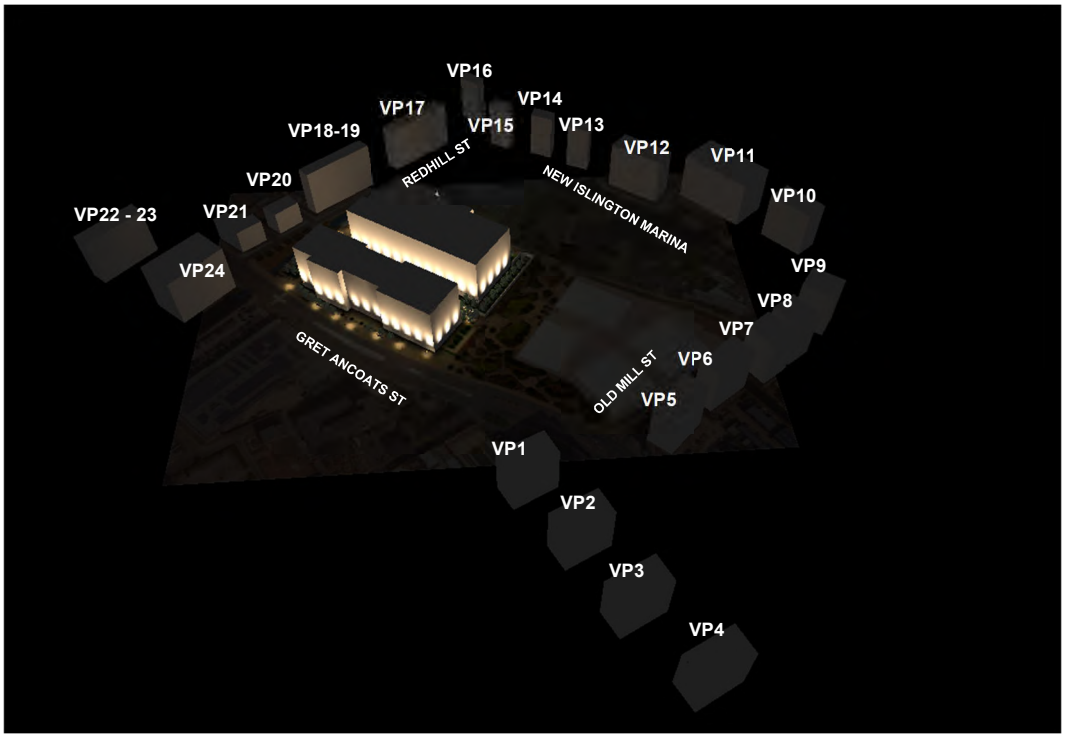


Figure 7-3 – 3D Rendering of all the Viewpoints

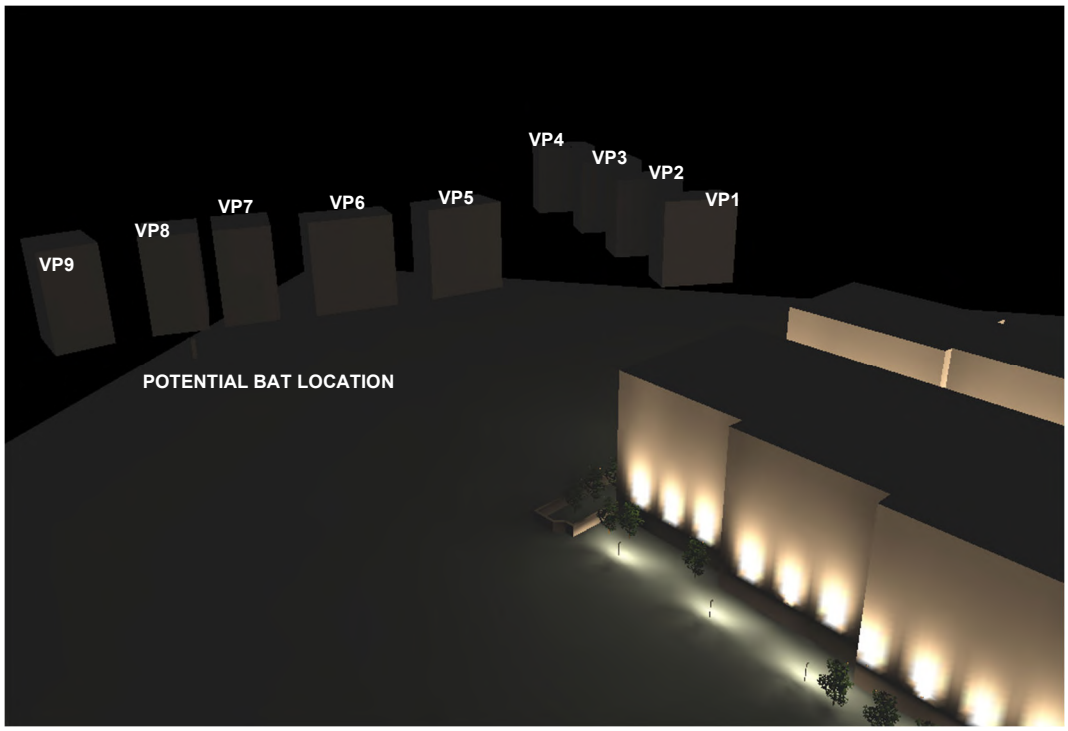


Figure 7-4 – 3D Rendering of Viewpoints VP1 – VP9 and Potential Bat Location

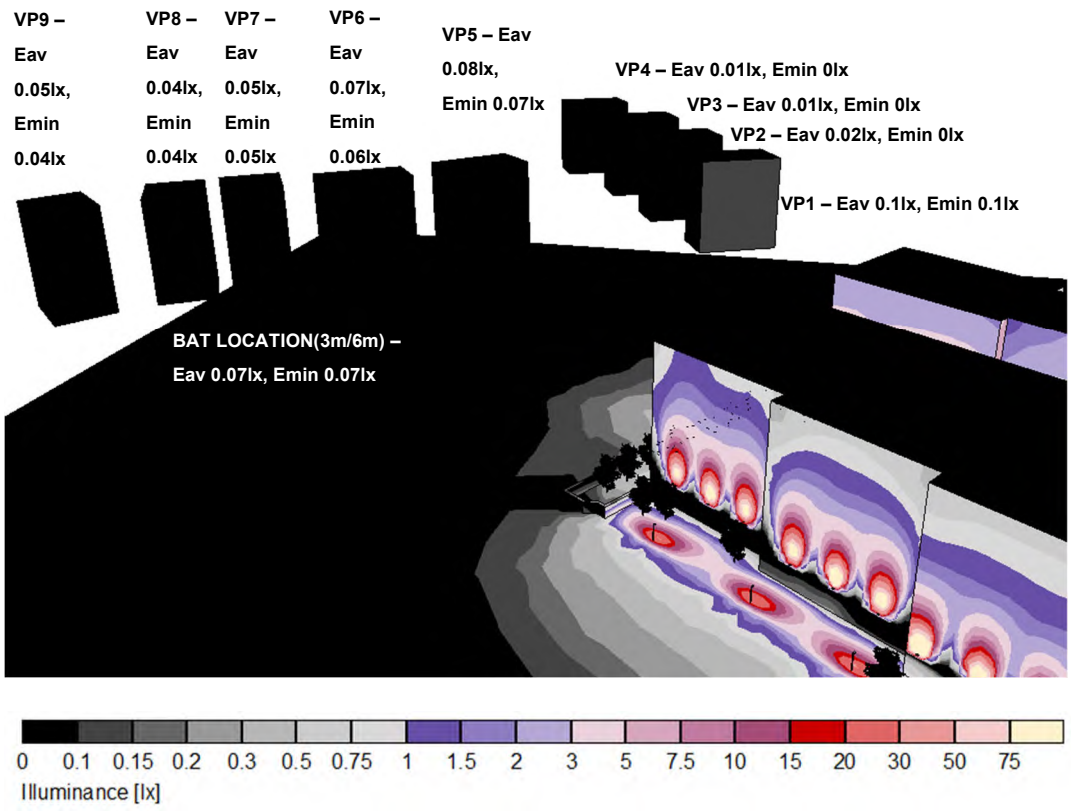


Figure 7-5 – Vertical and Horizontal Illuminance Heat Map of Viewpoint Reference VP1 – VP9 and Potential Bat Location

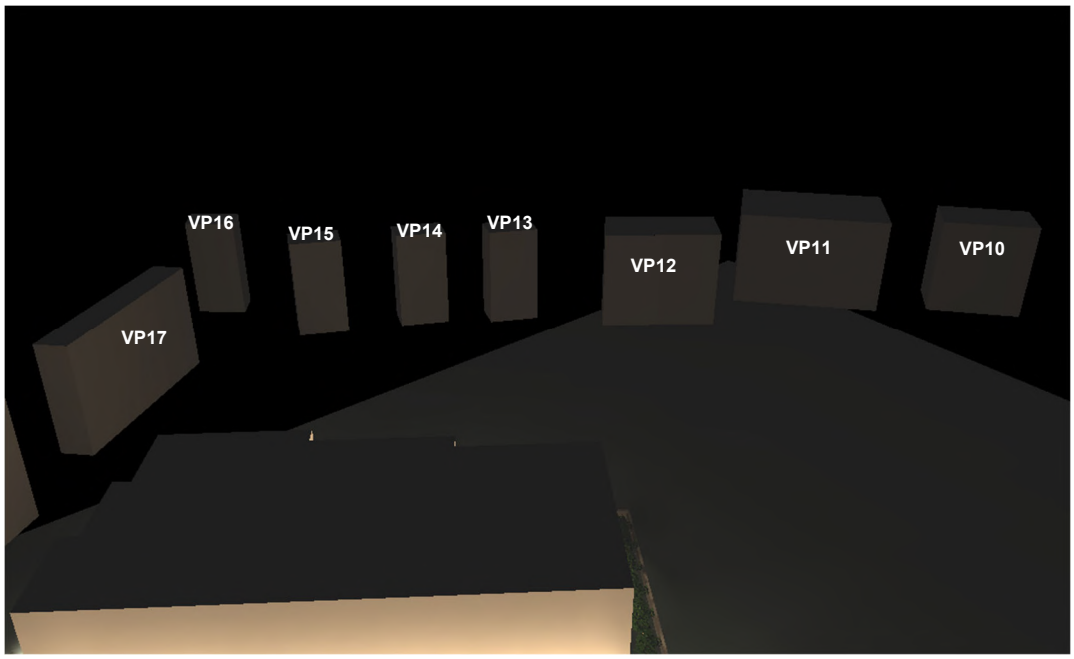


Figure 7-6 – 3D Rendering of Viewpoints VP10 – VP17

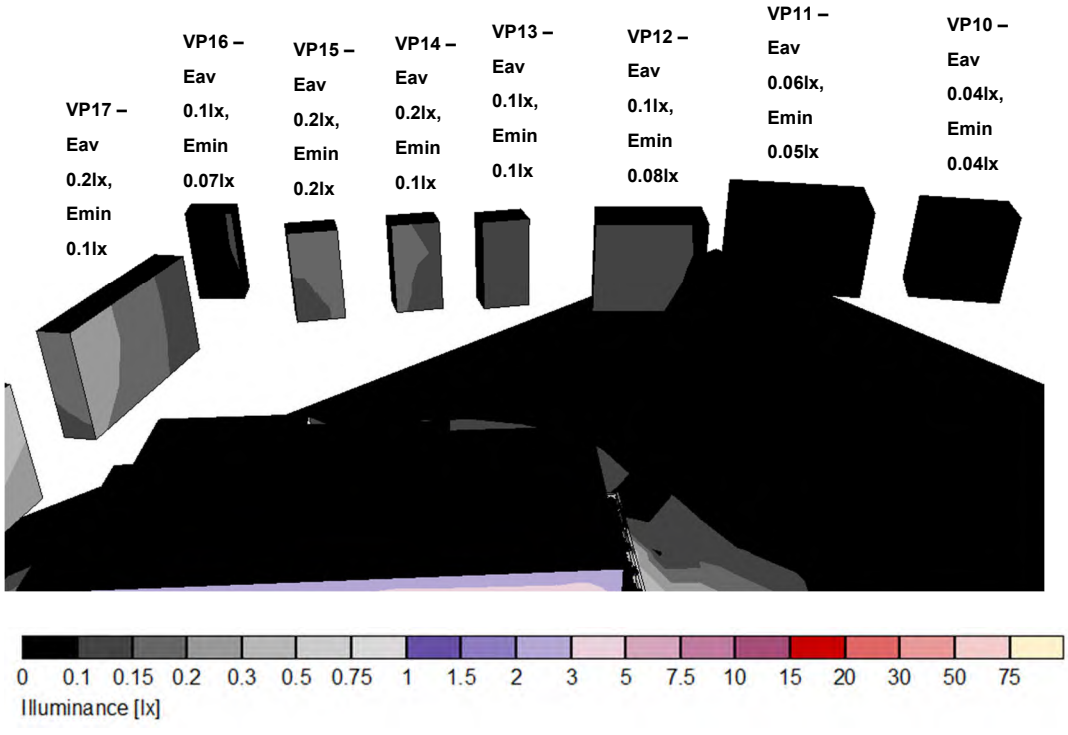


Figure 7-7 – Vertical and Horizontal Illuminance Heat Map of Viewpoint Reference VP10 – VP17

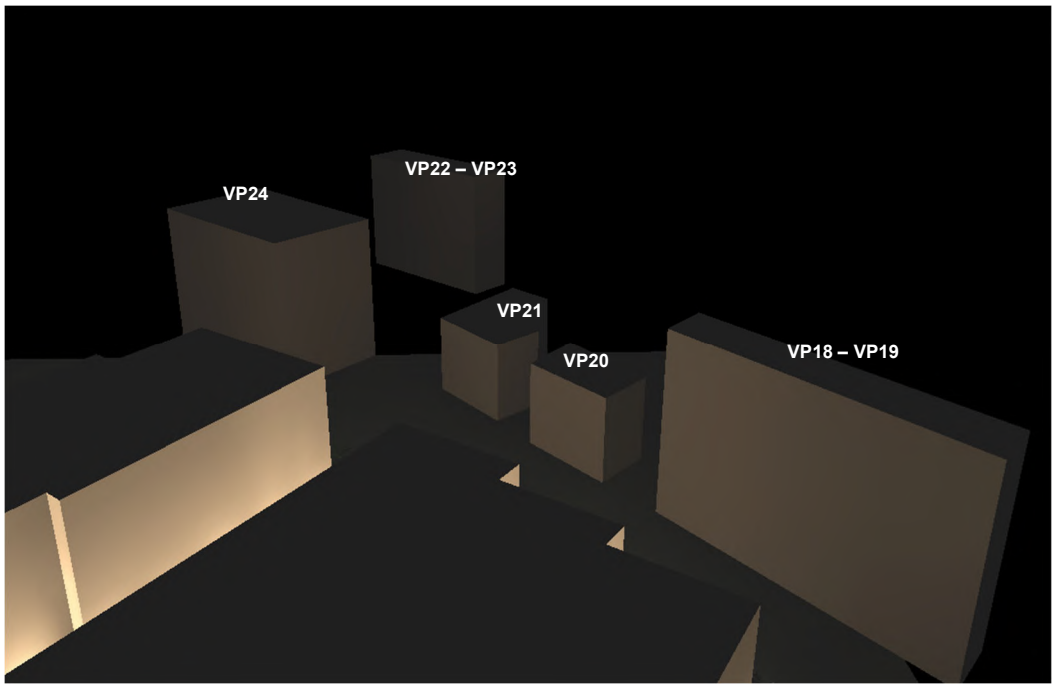


Figure 7-8 – 3D Rendering of Viewpoints VP18 – VP24

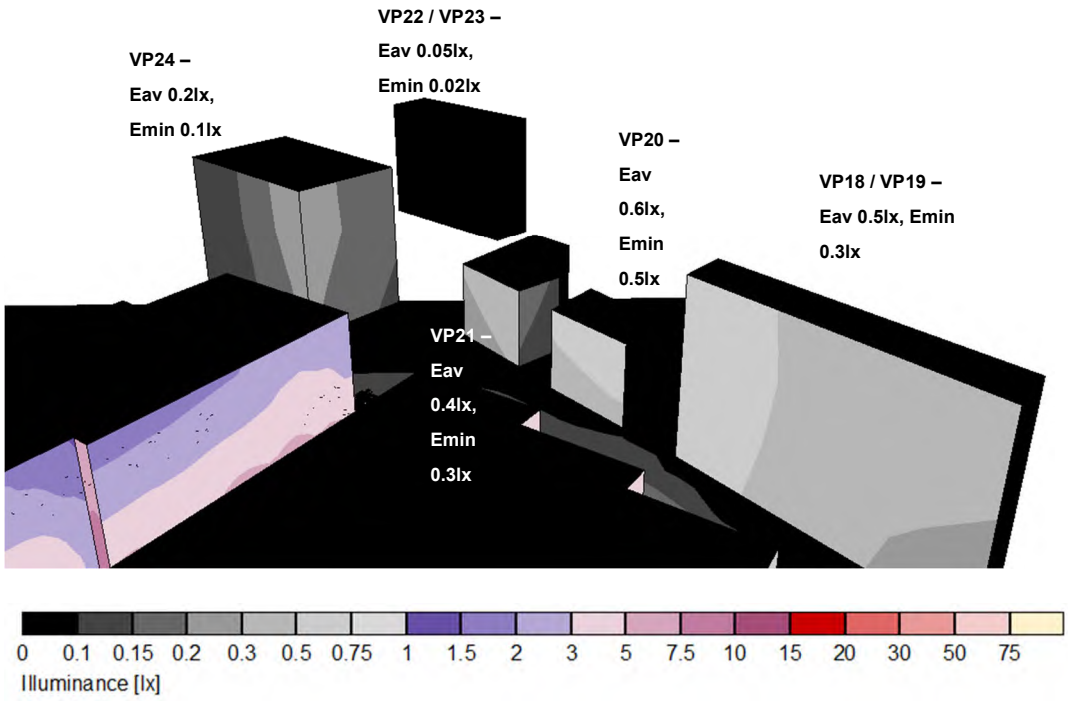


Figure 7-9 – Vertical and Horizontal Illuminance Heat Map of Viewpoint Reference VP18 – VP24

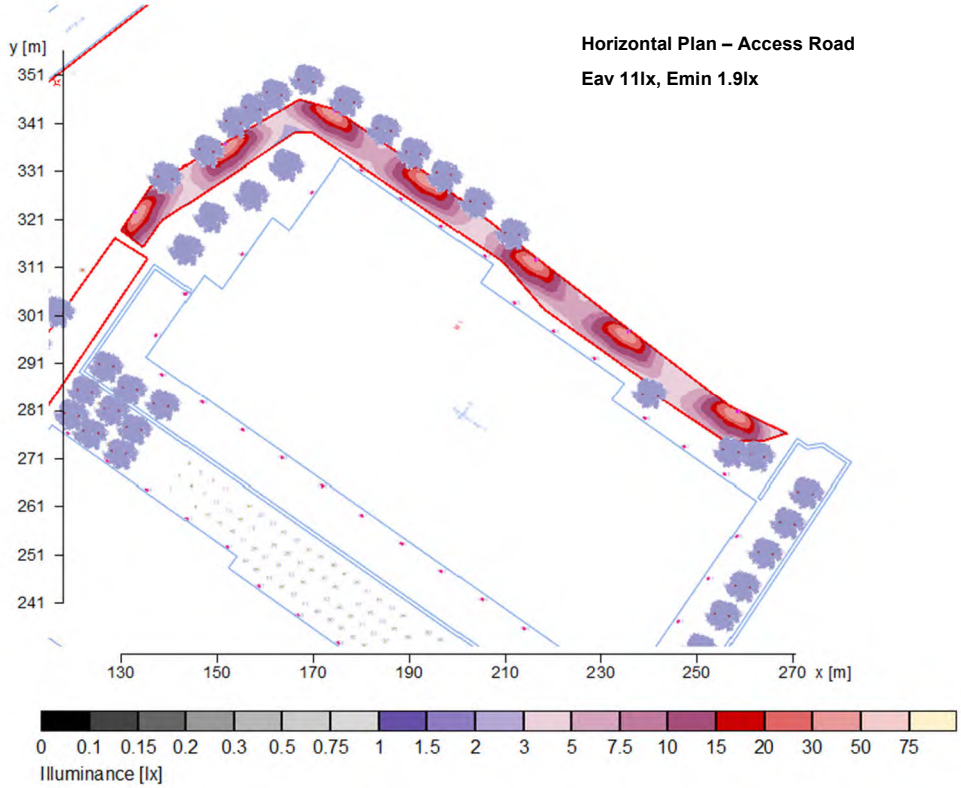


Figure 7-10 – Horizontal Illuminance Heat Map for Access Road

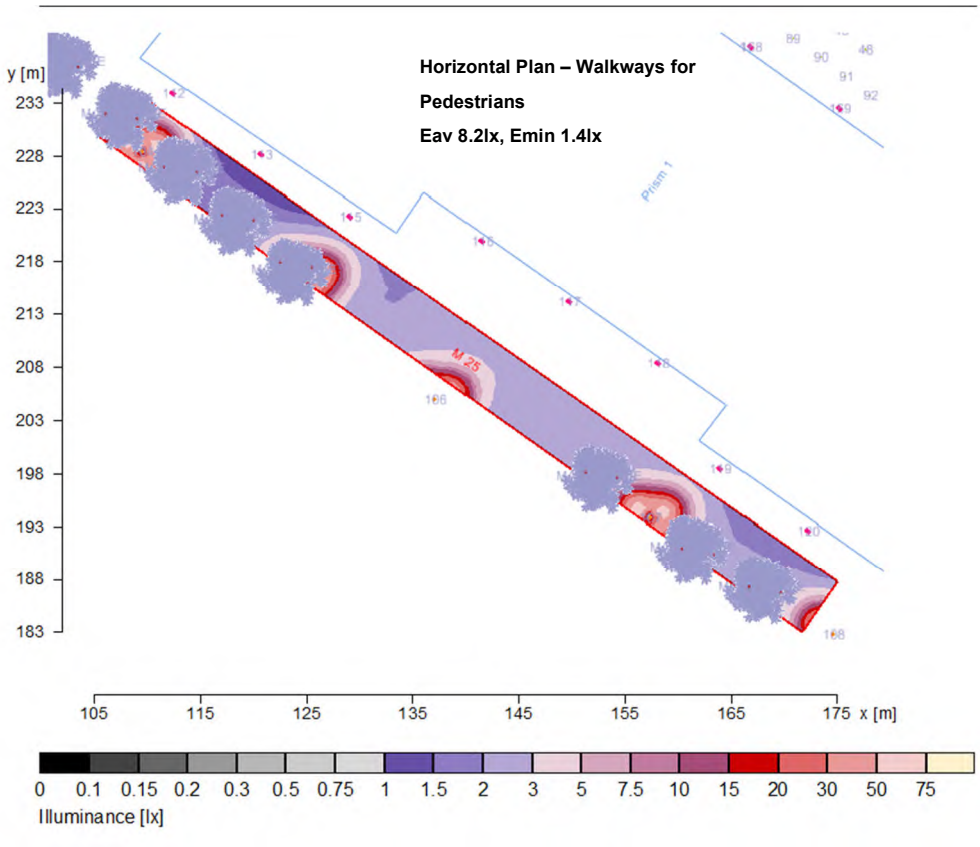


Figure 7-11 – Horizontal Illuminance Heat Map for Walkways for Pedestrians

7.8.4. The Upward Light Ratio or ULR is calculated for each proposes lighting equipment. The lighting plan for the Proposed Development has been designed to illuminate both the functional and aesthetic aspects of the Proposed Development while minimizing potential obtrusive impacts. ULR is the maximum permitted percentage of the luminaires flux that goes directly into the sky, the general term for ULR over a large area such as a city or town is referred to as Sky Glow. The Table 7-4 below shows the ULR for Lighting Columns and Wall-mounted floodlighting. Refer to Appendix A2

Table 7-4 – Upward Lighting Ratio for each type of luminaire

Location	Luminaire type	ULR Maximum Limit – (E3 Zone) 5%	Commentary
Front of House Public Realm Area	Lighting Columns	3%	None/Negligible Effect
Front of House Public Realm Area	Uplight for Trees	5%	None/Negligible Effect
Boulevard Lighting	Inground Uplight	-	Refer to Appendix A2 – Note3
Façade Lighting	Wall-Mounted Floodlighting	22%	The ULR can be reduced by applying a micro louvre directly on

Location	Luminaire type	ULR Maximum Limit – (E3 Zone) 5%	Commentary
			the optic. Refer to Appendix A2 – Note 3
Access Road	Lighting Column	0%	None/Negligible Effect

7.8.5. Based on the evaluation of the illuminance levels achieved, refer to Table 7-5 below shows the Light Intrusion and Luminous Intensity for each residential receptor.

Table 7-5 – Lighting Receptors Light Intrusion and Luminous Intensity Assessment

Viewpoint Number	Light Intrusion - Lux		Luminous Intensity - Candela (kcd)	Summary of Overall Predicted Impact
	Eav(lx)	Emin(lx)		
VP1	0.1	0.1	0.52	None/Negligible
VP2	0.02	0	0	None/Negligible
VP3	0.01	0	0	None/Negligible
VP4	0.01	0	0	None/Negligible
VP5	0.08	0.07	0.39	None/Negligible
VP6	0.05	0.06	0.050	None/Negligible
VP7	0.05	0.05	0.039	None/Negligible
VP8	0.04	0.04	0	None/Negligible
VP9	0.05	0.04	0	None/Negligible
VP10	0.04	0.04	0	None/Negligible
VP11	0.06	0.05	0	None/Negligible
VP12	0.1	0.08	0	None/Negligible
VP13	0.1	0.1	0	None/Negligible
VP14	0.2	0.1	0	None/Negligible
VP15	0.2	0.2	0	None/Negligible
VP16	0.1	0.07	0	None/Negligible

Viewpoint Number	Light Intrusion - Lux		Luminous Intensity - Candela (kcd)	Summary of Overall Predicted Impact
	Eav(lx)	Emin(lx)		
VP17	0.2	0.1	0	None/Negligible
VP18 - VP19	0.5	0.3	0	None/Negligible
VP20	0.6	0.5	0	None/Negligible
VP21	0.4	0.3	0	None/Negligible
VP22 – VP23	0.05	0.02	0	None/Negligible
VP24	0.2	0.1	0	None/Negligible

7.9. Proposed lighting equipment

7.9.1. **Floodlighting and wall-mounted luminaires**: This will be used to illuminate the facades of the MDC 1 and MDC 3 buildings, enhancing their architectural features. Refer to Figure 7-12



Figure 7-12 – Proposed Floodlights

7.9.2. **Lighting columns for walkways and access road**: Lighting columns, approximately 4m high, will be installed around the public spaces within the campus. These columns will provide functional lighting for pedestrian areas, access road ensuring safe navigation at night. Refer to Figure 7-13



Figure 7-13 – Proposed Lighting Columns

- **Tree uplight**: Uplight will be positioned around key trees within the development to create an attractive, illuminated landscape without contributing excessively to sky glow or light spill. Refer to Figure 7-14.



Figure 7-14 – Proposed Tree Uplight

- **Boulevard lighting**: Between MDC 1 and MDC 3, a boulevard will feature linear and spot LED markers, providing both functional and decorative lighting. The lighting design has been coordinated closely with the project architects to ensure consistency in style and minimal environmental impact. Refer to Figure 7-15.



Figure 7-15 – Proposed LED Marker Luminaire

7.10. Lighting control

7.10.1. For the Proposed Development, the lighting system is switched and controlled via the Building Lighting Control System. This section provides an overview of the external lighting control system elements that will be implemented for efficient lighting system.

7.10.2. Lighting will be controlled by wireless photoelectric control units (PECUs) and other control regimes, such as time regimes. Manual override control of the LCS with a built-in timer to stop being left on after operations, dependent on the aspirations of the operator. PECU and LCS are systems used to switch and control exterior lighting. In any event, lighting should only be provided during the hours of darkness and be dependent on operational requirements. Controls may allow temporal changes in lighting levels where appropriate, such as dimming or switch-off during the early hours of the morning or when tasks are not being undertaken on Site.

7.10.3. LCS - Lighting Control Systems (LCS) is a system utilised in remote dynamic lighting control. Using LCS, the operator can remotely choose exactly when to switch each individual streetlight on or off and/or by how much to reduce the lamp power. This allows any number of switching events/scenes and /or variable lighting levels such as dimming and trimming of lighting levels. The LCS also provides other benefits such as fault detection, remote monitoring, energy management and control etc.

7.10.4. PECU - Photoelectric control units are used to switch streetlight on and off at dusk and dawn respectively. PECU only certain types of PECU can offer remote switching or control. we are utilising PECUs which have the ability to work in either stand-alone switching and dimming photocells or as sensors for remote switching and dimming photocells (by the LCS)The PECUs can turn lighting on when the ambient light falls below a pre-set level, or automatically adjust the light output of luminaires depending on the amount of natural light available, to a maintained illuminance level.

7.10.5. Passive Infra-Red (PIR) – This is an occupancy sensor which switches on when movement is detected. This can be used around perimeter of the building for security lighting. A programable delay is normally incorporated to avoid nuisance switching. The occupancy sensors will be enabled to work in conjunction with time regime curfews by the LCS.

8. Recommendations

8.1. General

8.1.1. Lighting will be implemented with due consideration given to the best practicable means and prevent, or to counteract, the effects of artificial light on the surrounding environment – including any sensitive receptors that have views of the Proposed Development.

8.1.2. Sensitive and robust design and careful selection of equipment will ensure that the impact of any permanent lighting may be mitigated. Design of the Proposed Development should include an obtrusive light study, in accordance with the constraints mandated by ILP GN01:2021 for Environmental Zone E3, to demonstrate that the proposals are acceptable.

8.1.3. Temporary construction lighting, where required, will be assessed in accordance with industry best practice, subject to review by a competent lighting professional and should adhere to the obtrusive light constraints imposed by the applicable Environmental Zone. The contractor will

be required to provide specifications calculations and drawings of his construction lighting proposals.

8.1.4. Permanent infrastructure lighting should be designed in accordance with the standards and guidance listed in this document, be designed by a competent lighting professional, and should adhere to the obtrusive light constraints imposed by the applicable Environmental Zone. Lighting equipment and operation should satisfy the requirements listed in this document regarding mitigation for bats and other identified sensitive species, when known.

8.2. Equipment

8.2.1. Use LED luminaires that allow the following benefits to be realised:

- Easily controllable distribution to reduce spill light and other obtrusive param.
- A more limited range of spectral power distribution, with predominance in the longer wavelength end of the spectrum, to aid environmental mitigation.
- Warmer colour temperatures to provide a more suitable installation ecologically and a more comfortable installation for users and residents where required.
- Easily fitted with accessories such as Cowls, Shields, Hood, and Louvre

8.2.2. LED luminaires should be selected that:

- Utilise full cut-off luminaires that exhibit no direct output above the horizontal.
- That are to be installed at 0° with no inclination.
- Have a warmer colour temperature not exceeding 3000K for ecological sensitive environments.
- Accord with the operator's or adopter's specification.

8.3. Controls

8.3.1. A system of control and operation should be considered that allows:

- Dimming of lighting to a lower level during periods of low use and operation.
- Switch-off of lighting when areas are not in use or is not in operation.
- The use of detection-operated lighting where appropriate so that light is only emitted for the period required.
- Vary lighting levels in accordance with criticality of tasks subject to risk assessment.

9. Conclusion

9.1.1. The obtrusive lighting assessment for the Manchester Digital Campus demonstrates that the proposed lighting design successfully meets the relevant national and local standards for obtrusive light. The use of advanced lighting techniques, including LED luminaires, allows for energy-efficient and ecologically considerate illumination while minimizing obtrusive effects on the surrounding environment, especially residential receptors.

9.1.2. The baseline assessment undertaken has identified the Proposed Development as an area of suburban character, medium district brightness corresponding with Environmental Zone E3 as defined in ILP GN01/21.

9.1.3. Baseline conditions for lighting have been defined in the vicinity of the Proposed Development and immediate surrounds through desk study and visual Site survey (daytime and dark survey); to establish any potential receptor and establish suitability of existing lighting strategy and inform the assessment.

9.1.4. Relevant legislation, standards, good practice guidelines and policies have been consulted for the assessment that include suitable and standard levels of illumination for the Proposed Development, environmental limitations imposed by legislation and relevant guidance and Site conditions.

9.1.5. Based on the baseline conditions, biodiversity chapter findings, evaluation of the lighting conditions, the lighting for the Proposed Development is such that:

- The proposed lighting provision is in accordance with the limitations mandated by ILP GN01/21 corresponding with Environmental Zone E3, and principles recommended in ILP GN08/23.
- The proposed lighting in most areas within the Proposed Development delivers the right amount of light in the right place and at the right time to create a healthier, safer, and greener network.
- A sensitive and robust lighting installation that looks to current standards, good practice, and careful selection of existing equipment has been demonstrated such that the impact of this permanent lighting is minimal.
- The proposed lighting within the Proposed Development meets the current façade standards for environmental zone E3. However, the ULR for the proposed floodlight is higher. It is worth noting that the average illuminance levels comply with the current standards.

9.1.6. Should the luminaire be replaced,

- A compliant lighting levels should be achieved.
- Proposed luminaire will be capable of being fitted with shields, hood, cowl, or micro louvres to limit obtrusive light.
- Luminaire shall be capable of dimming, energy efficient and compatible with effective lighting control system.
- Lighting installation to ensure that the main beam angle directed towards any potential observer is no greater than 70 degrees to limit glare.

9.1.7. Overall, the Proposed Development is situated within an urban setting with significant artificial lighting reducing the overall suitability for foraging/commuting bats and other species likely to be impacted by artificial lighting.

9.1.8. The outcome of the assessment showed that there is no impact on surrounding residential and ecological receptors due to artificial lighting. Therefore, no cumulative effects are anticipated as a result of the Proposed Development lighting system. There are no anticipated significant issues as a result of the proposed lighting.

Terms and Abbreviations

Table 9-1 – Glossary and acronyms

Terms	Definition	Units	Abbreviation
Clean Neighbourhoods and Environment Act 2005	A UK Act of Parliament designed to improve the quality of local environments by giving local authorities more effective powers and tools.		CNEA
National Planning Policy Framework	A framework setting out the government's planning policies for England and how these are expected to be applied.		NPPF
National Planning Practice Guidance	Official government guidance on planning policy in the UK.		NPPG
Commission Internationale de l'Eclairage	An international authority on light, illumination, colour, and colour spaces.		CIE
Institution of Lighting Professionals	A UK-based organization dedicated to promoting excellence in all forms of lighting.		ILP
Chartered Institution of Building Services Engineers	A professional body that represents building services engineers, providing expertise in mechanical, electrical, public health, fire and information technology engineering.		CIBSE
GPA	Government Property Agency		GPA
MDC	Manchester Digital Campus		MDC
Royal Institute of British Architects	A stage in the RIBA Plan of Work framework that includes concept design and development.		RIBA
Light Emitting Diode	A semiconductor light source that emits light when current flows through it.		LED
High Intensity Discharge	Gas Discharge Arc Lamps		HID
Passive Infra-Red	A sensor technology used for motion detection.		PIR
British Standards Institute	The national standards body of the United Kingdom, producing technical standards on a wide range of products and services, and supplying certification and standards-related services.		BSI
Site of Special Scientific Interest	Conservation designation denoting a protected area in the UK.		SSSI
Local Nature Reserve	A protected area of importance for wildlife, flora, fauna or features of geological or physiographical interest.		LNR
Site of Importance for Nature Conservation	Sites designated by local authorities in the UK for their local nature conservation value.		SINC
Site of Local Importance for Nature Conservation	Local designation for areas of wildlife or geological interest.		SLINC

Terms	Definition	Units	Abbreviation
Compact Fluorescent Lamp	A type of energy-saving light bulb that uses fluorescent lighting technology.		PL-L
Department for Environment, Food & Rural Affairs	UK government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities.		DEFRA
lux	A unit of illuminance in the International System of Units (SI), equivalent to one lumen per square meter.	lx	
Central Management System	A system used for controlling and monitoring street lighting, allowing for remote management of lighting levels, operational hours, and maintenance needs.		CMS
Photoelectric Control Units	Devices used in lighting systems to automatically control the lights based on the level of ambient light, commonly used to switch streetlights on at dusk and off at dawn.		PECUs

Appendix A. Recommended maximum values of light parameters for the control of obtrusive light

A.1. Table 4 (CIE 150 table 3): Limits for the luminous intensity of bright luminaires

Table 4 (CIE 150 table 3): Limits for the luminous intensity of bright luminaires[4]

Light technical parameter	Application conditions	Luminaire group (projected area A_p in m²)					
		$0<A_p \le 0.002$	$0.002<A_p \le 0.01$	$0.01<A_p \le 0.03$	$0.03<A_p \le 0.13$	$0.13<A_p \le 0.50$	$A_p > 0.5$
Maximum luminous intensity emitted by luminaire (I in cd)[5]	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 0	0.63 d 0	1.3 d 0	2.5 d 0	5.1 d 0	2,500 0
	E2 Pre-curfew Post-curfew	0.57 d 0.29 d	1.3 d 0.63 d	2.5 d 1.3 d	5.0 d 2.5 d	10 d 5.1 d	7,500 500
	E3 Pre-curfew Post-curfew	0.86 d 0.29 d	1.9 d 0.63 d	3.8 d 1.3 d	7.5 d 2.5 d	15 d 5.1 d	10.000 1,000
	E4 Pre-curfew Post-curfew	1.4 d 0.29 d	3.1 d 0.63 d	6.3 d 1.3 d	13 d 2.5 d	26 d 5.1 d	25,000 2,500

Note 1 d is the distance between the observer and the glare source in metres;

Note 2 A luminous intensity of 0 cd can only be realised by a luminaire with a complete cut-off in the designated directions;

Note 3 A_p is the apparent surface of the light source seen from the observer position

Note 4 For further information refer to Annex C of CIE 150

Note 5 Upper limits for each zone shall be taken as those with column A_p>0.5

Considerations to aid the application of Table 4 and the assessment process.

- The assessment of A_p for observers can prove difficult and will vary for all observer positions and distances.
- The above information is applicable for the consideration of a single luminaire, but where two or more luminaires are located in close proximity to each other that to the observer they appear as a single light source, then the assessment shall be undertaken based upon the combined bright surfaces of luminaires (A_p) in the direction of the observer or, from positions where such views are likely to be maintained.
- In installations that involve lighting poles, towers or columns, the luminaires will often be viewed against the night sky. The contrast between the background sky and the bright surface areas of the luminaires can be considerable. In such installations the curfew levels set for each environmental zone shall be applied, with the exception that such installations within an E4 zone will be designed to suit the curfew requirements of an E3 zone.

[4] Amended based upon the approach taken by NSVV Nederlandse Stichting Voor Verlichtingskunde (Dutch: Dutch Foundation for Illumination; The Netherlands) and to consider CIE150 Annex C Table C.2

Appendix 3 provides a supplementary guidance to aid the application and use of Table 4.

A.2. Limitation of skyglow

Limitation of skyglow

Table 6 (CIE 150 table 5): Maximum values of upward light ratio (ULR) of luminaires

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

Note 1 This is the primary approach to limit skyglow and is suitable to compare different single luminaires and mitigate the contribution of each luminaire within an installation.

Note 2 This does not take into account the effect of light reflected upwards from ground that also contributes to skyglow.

Note 3 Some lighting schemes will require the deliberate and careful use of upward light, e.g. ground recessed luminaires, ground mounted floodlights and festive lighting, to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.

A.3. Obtrusive lighting limitations

Environmental Zone	Maximum values of upward light ratio (ULR) / % of luminaires*2	Illuminance in the vertical plane (E_v)*1	
		Pre-Curfew*3	Post Curfew*3
E3	5	10 Lux	2 Lux

*1 Table 3 ILP GN01:2021 (Table 2 CIE 150:2017).

*2 Table 6 ILP GN01 2021 (Table 5 CIE 150:2017):

*3 Curfew: We have not received the requirements of the curfew time from environmental health officer. However, ILP GN01:2021 advises that application curfew times often commence between 21:00 to 23:00 and may run until 07:00. 23:00

Appendix B. Proposed lighting mark-up



KEY

- **NATURAL STONE PAVING** — 200 X 100mm X 80mm Pennant Sandstone or Scoutmoor Sandstone or similar subject to comment.
- **NATURAL STONE PAVING - TO THE BOULEVARD** — The Boulevard natural stone paving with in built flexible lighting lines - 300 X 200mm Yorkstone
- **NATURAL STONE BANDING** — Silva Vilar Granite or subject to comment - 200mm x 100mm with contrasting surface finish
- **BUFF GRANITE SETTS** — 200 x 100mm Buff coloured granite mix - Figueiredo, Fernando beige SPI and Silva Montemuro Amarelo or similar subject to comment
- **GRANITE SETTS - TO CANAL PLAZA** — 200 X 100mm Grey Granite Setts (Azul Noche, Angola black, Preta Ostevias or similar subject to comment) to match Redhill Street canal front
- **GRANITE SETTS - TO THE BOULEVARD THRESHOLDS** — 100 X 100mm GREY Granite setts
- **NATURAL STONE KERB EDGE** — Silva Vilar Granite or similar subject to comment - 200mm wide, 60mm upstand in contrasting colour
- **REINFORCED GRASS PAVING** — Hardscape Hydro Lineo or similar subject to comment
- **GRAVEL** — Cotswold buff colour 1.5m Edge min.
- **COLOURED MACADAM** — Weathered Buff Tarmac Ulticolour or similar subject to comment
- **EXISTING LIGHTING COLUMN (INDICATIVE POSITION)** — (To be replaced / relocated subject to approval by Manchester City Council)
- **L1: LIGHTING COLUMN**
- **L2: FEATURE / SCULPTURAL LIGHTING TO BOULEVARD**
- **L3: UPLIGHTER / WALL MOUNTED LIGHTING**
- **L4: TREE UPLIGHTER**

LIGHTING KEY

- L1a - Proposed 4m height with post top lighting unit.
- L1b - Proposed architectural lighting column (light building element).
- L3 - Wall mounted facade lighting
- L4 - Indicative tree uplights
- L2: FEATURE / SCULPTURAL LIGHTING TO BOULEVARD — This will be a combination of inground spot and linear markers.

Lighting Levels (BS EN 12464-2)		
	Horizontal Illuminance Em lx	Horizontal Illuminance Uo
Access Road	10lx	0.40Uo
Walkways for pedestrians	5lx	0.25Uo

GENERAL NOTES:

1. This drawing is not for construction.
2. Do not scale from this drawing.
3. Drawing intended to be viewed printed at A0
4. This drawing is to be read in conjunction with all relevant engineering and environmental drawings.
5. Discrepancies and/or ambiguities between this drawing and information given elsewhere must be reported immediately for clarification before proceeding.
6. Existing boundary treatments to site extents to be retired in situ.
7. Installation and fixing for prefabricated street furniture and/or ancillary items are to be in accordance with the manufacturer's recommendations and guidance and are subject to comment.
8. All planting is to comply with the relevant sections of BS 3936 Nursery Stock Specification.
9. All tree planting shall be positioned in accordance with BS 5837 Trees in relation to design, demolition, and construction - Recommendations and BS 8545 Trees: from nursery to independence in the landscape - Recommendations.
10. The overseeing authority shall agree upon the specification and location of root barriers.The design and implementation of root barriers shall be as per the manufacturer's recommendations and as per guidance set out in BS 8545 Trees: From Nursery to Independence in the Landscape – Recommendations.
11. All drainage subject to drainage engineers design and connection to existing drainage is subject to correct approval and testing.
12. **Drawings to be read in conjunction with all relevant landscape, architecture and engineering drawings.**

Scale 1 : 250

0 5 12.5 25 m

Government Property Agency

AtkinsRéalis

MANCHESTER DIGITAL CAMPUS

CONCEPT LIGHTING PLAN

Scale	Originated	Checked	Reviewed	Authorised
1:250	AR	KC	SW	NB
Original Size	Date	Date	Date	Date
A0	05/07/24	05/07/24	05/07/24	05/07/24
Drawing Number				Revision
MDCX-ATR-ZZ-ZZ-DR-L-2310010				P01.1

Appendix C. Lighting calculation report

Manchester Digital Campus

Installation : Lighting Calculation

Project number	:	5223289/318
Customer	:	Government Property Agency
Processed by	:	Saurabh Mathure
Date	:	22.10.2024

The following values are based on precise calculations performed on calibrated lamps and luminaires, and their configurations, whereby gradual, unavoidable deviations can occur in practice. All guarantee claims are excluded for the specified data.

This exclusion of liability applies irrespective of the legal grounds for both damages and consequential damages suffered by users and third parties.

1 Luminaire data

1.1 WE-EF;Eulumdat2, ETC109 VA:IP68:LED-4/0,5W;ETC10... (185-3319)

1.1.1 Data sheet

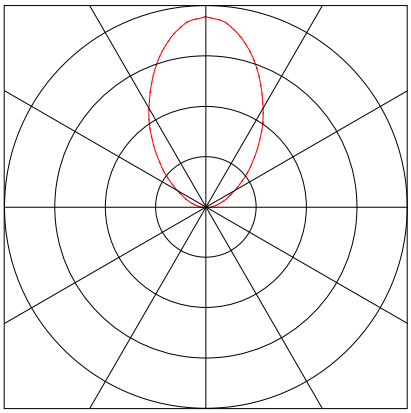
Manufacturer: WE-EF;Eulumdat2

185-3319 ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires

Luminaire data		
Luminaire efficiency	:	25.9%
Luminaire efficacy	:	4.21 lm/W
Classification	:	E03 ↓0.4% ↑99.6%
CIE Flux Codes	:	0 0 0 0 26
UGR 4H 8H	:	- / -
Power	:	0.8 W
Luminous flux	:	3.4 lm

Equipped with		
Quantity	:	4
Designation	:	LED-4/0,5W/830 white - 3000K
Colour	:	3000K
Luminous flux	:	3.3 lm
Colour reproduction	:	75

Dimensions : Ø65 mm x 50 mm



1 Luminaire data

1.2 WE-EF;Eulumdat2, AFL120-WL [S71] IP66:LED-8/8W/2... (102-0346)

1.2.1 Data sheet

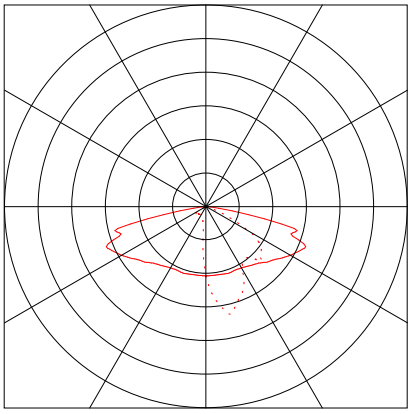
Manufacturer: WE-EF;Eulumdat2

102-0346 AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area Lighting

Luminaire data		
Luminaire efficiency	:	81.3%
Luminaire efficacy	:	107.78 lm/W
Classification	:	A30 ↓100.0% ↑0.0%
CIE Flux Codes	:	32 66 95 100 81
Glare	:	n/a / D5
Power	:	35 W
Luminous flux	:	3772.3 lm

Equipped with		
Quantity	:	16
Designation	:	LED-16/32W - 3000K
Colour	:	3000K
Luminous flux	:	290 lm
Colour reproduction	:	80

Dimensions : 605 mm x 250 mm x 192 mm



1 Luminaire data

1.3 WE-EF;Eulumdat2, LTP444 IP44:LED-FT-37W/3K;LTP44... (116-0207)

1.3.1 Data sheet

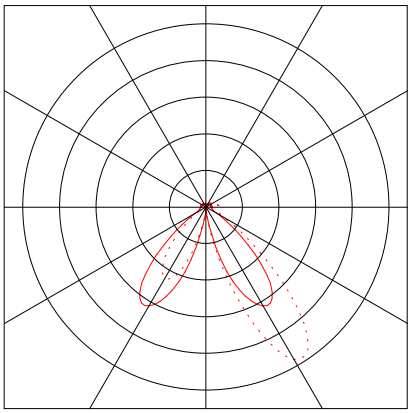
Manufacturer: WE-EF;Eulumdat2

116-0207 LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns

Luminaire data		
Luminaire efficiency	:	39.9%
Luminaire efficacy	:	60.61 lm/W
Classification	:	B41 ↓87.6% ↑12.4%
CIE Flux Codes	:	60 89 95 88 40
Glare	:	G*1 / D6
Power	:	42 W
Luminous flux	:	2545.6 lm

Equipped with		
Quantity	:	1
Designation	:	LED-FT-37W/830 - 3000K
Colour	:	3000K
Luminous flux	:	6380 lm
Colour reproduction	:	80

Dimensions : 205 mm x 205 mm x 2328 mm



1 Luminaire data

1.4 GRIVEN, Capital 100 Elliptical WW (AL5005ELWW)

1.4.1 Data sheet

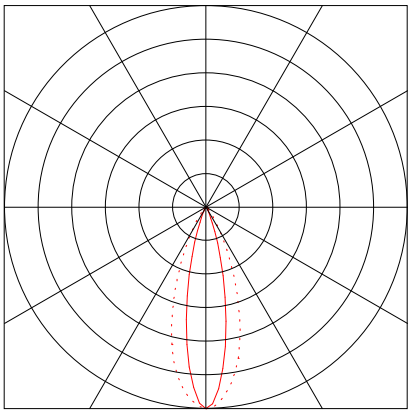
Manufacturer: GRIVEN

AL5005ELWW **Capital 100 Elliptical WW**

Luminaire data		
Luminaire efficiency	:	99.1%
Luminaire efficacy	:	86.3 lm/W
Classification	:	A80 ↓100.0% ↑0.0%
CIE Flux Codes	:	95 99 100 100 98
UGR 4H 8H	:	12.2 / 17.3
Power	:	69 W
Luminous flux	:	5954.9 lm

Equipped with		
Quantity	:	1
Designation	:	White LEDs
Colour	:	3000
Luminous flux	:	6009 lm
Colour reproduction	:	0

Dimensions : 280 mm x 270 mm x 80 mm



1 Luminaire data

1.5 WE-EF;Eulumdat2, ETC120-GB [EE] VA:IP67:LED-3/6W... (185-7593)

1.5.1 Data sheet

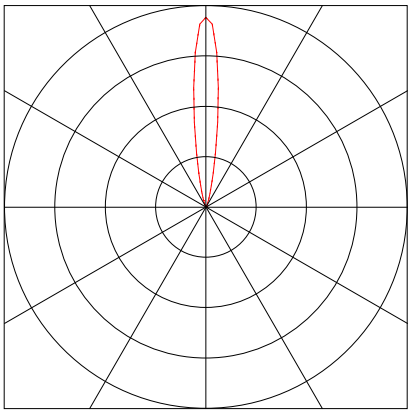
Manufacturer: WE-EF;Eulumdat2

185-7593 ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires

Luminaire data		
Luminaire efficiency	:	74.8%
Luminaire efficacy	:	86.77 lm/W
Classification	:	E04 ↓0.0% ↑100.0%
CIE Flux Codes	:	- - - 0 75
UGR 4H 8H	:	- / -
Power	:	7.5 W
Luminous flux	:	650.8 lm

Equipped with		
Quantity	:	3
Designation	:	LED-3/6W/830 - 3000K
Colour	:	3000K
Luminous flux	:	290 lm
Colour reproduction	:	80

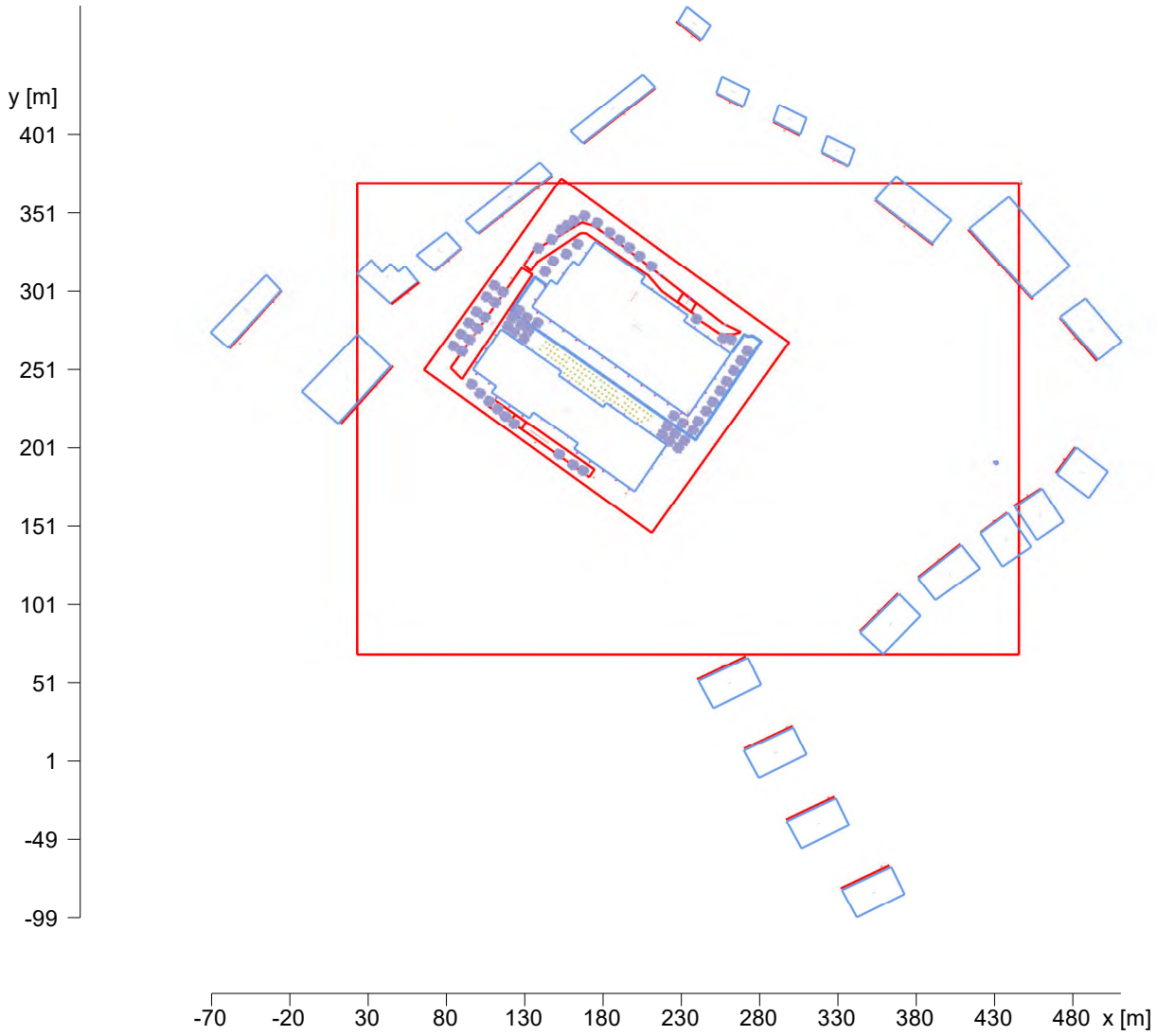
Dimensions : Ø160 mm x 195 mm



2 Exterior 1

2.1 Description, Exterior 1

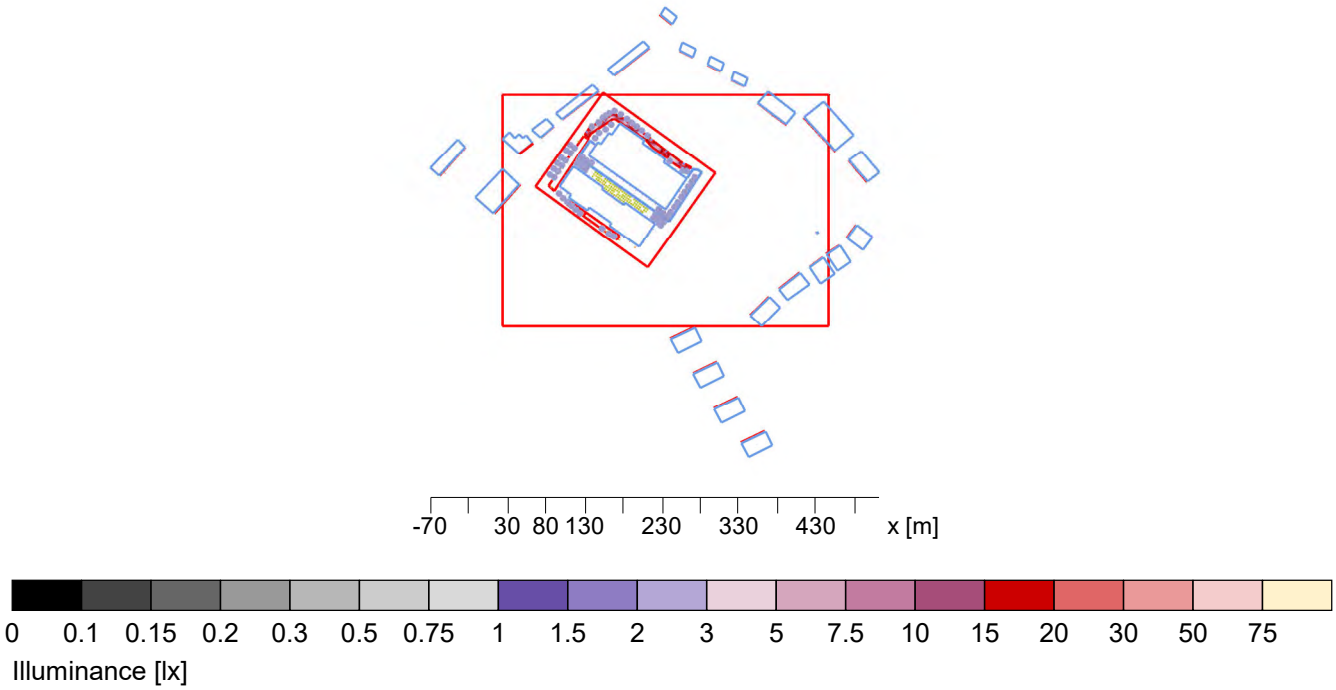
2.1.1 Floor plan



2 Exterior 1

2.2 Summary, Exterior 1

2.2.1 Result overview, Access Road



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	11 lx
Minimum illuminance	E_{min}	1.9 lx
Maximum illuminance	E_{max}	49.2 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:2.32 (0.42)
Diversity U_d	E_{min}/E_{max}	1:3.4 (0.29)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2 Exterior 1

2.2 Summary, Exterior 1

2.2.1 Result overview, Access Road

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

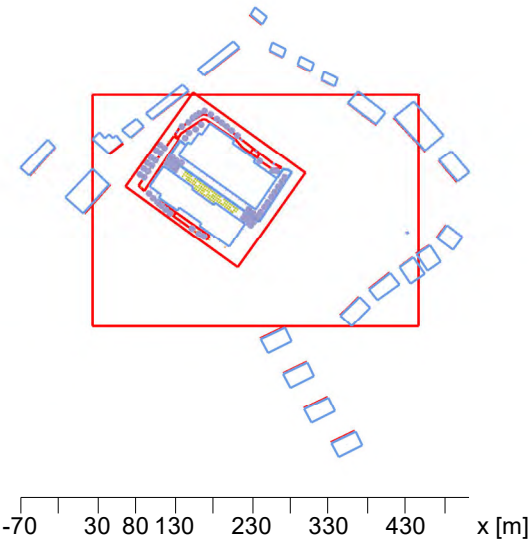
GRIVEN

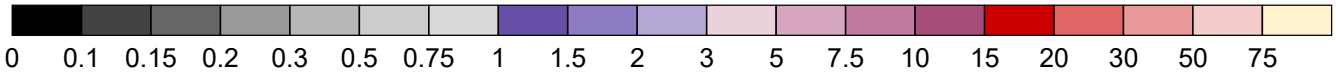
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.2 Result overview, VP1





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.14 lx
Minimum illuminance	E_{min}	0.13 lx
Maximum illuminance	E_{max}	0.14 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.05 (0.95)
Diversity U_d	E_{min}/E_{max}	1:1.08 (0.93)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.2 Result overview, VP1

2 7 x
Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x
Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

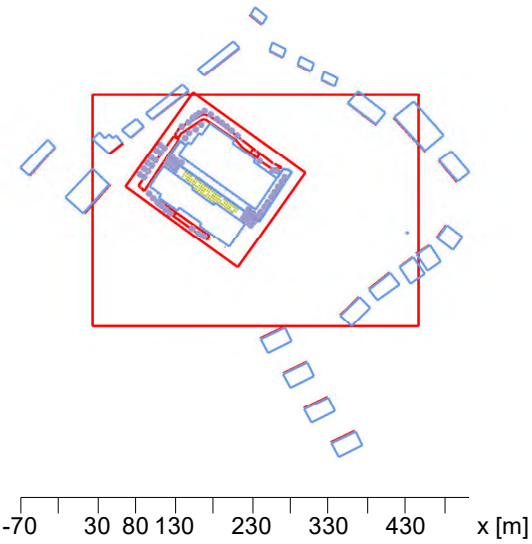
5 112 x
Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

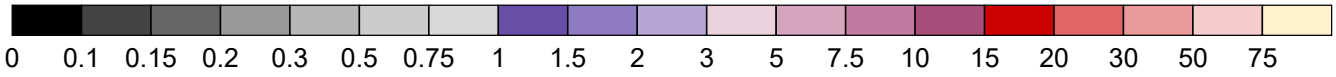
GRIVEN

4 62 x
Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.3 Result overview, VP2





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.02 lx
Minimum illuminance	E_{min}	0 lx
Maximum illuminance	E_{max}	0.06 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:--- (---)
Diversity U_d	E_{min}/E_{max}	1:--- (---)

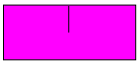
Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.3 Result overview, VP2

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

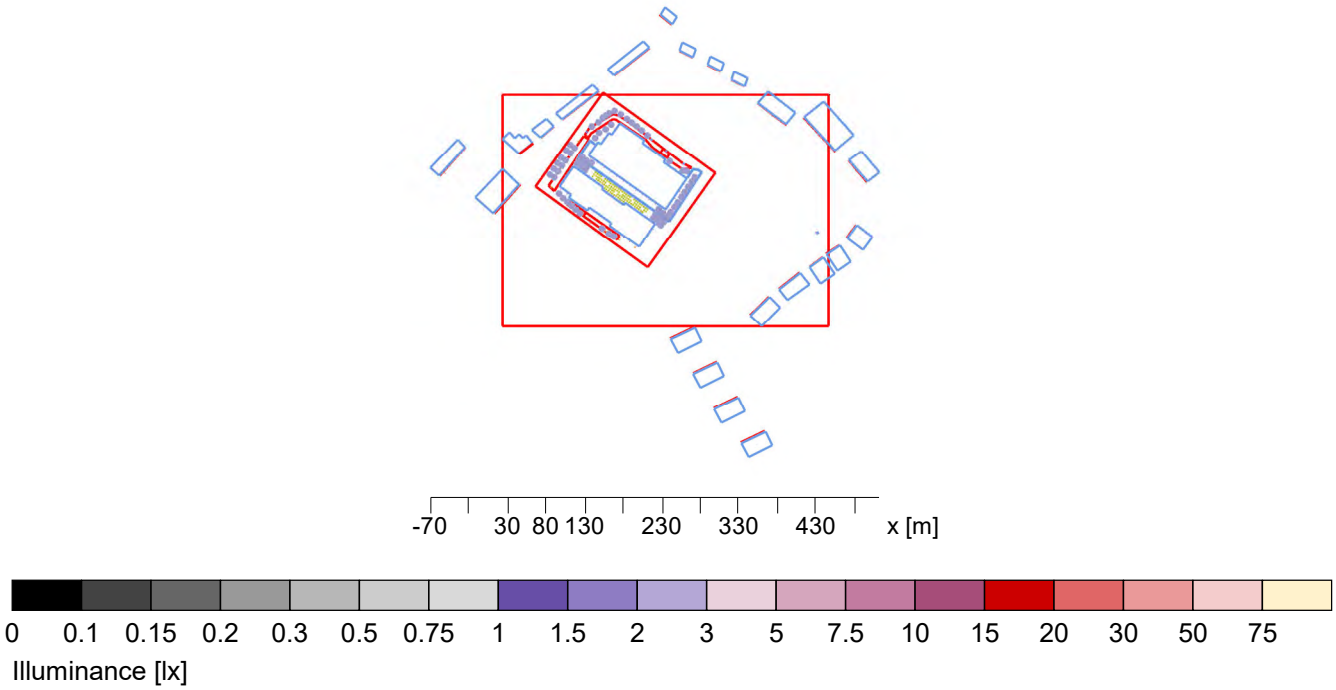
GRIVEN

4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.4 Result overview, VP3



General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.01 lx
Minimum illuminance	E_{min}	0 lx
Maximum illuminance	E_{max}	0.03 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:--- (---)
Diversity U_d	E_{min}/E_{max}	1:--- (---)

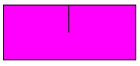
Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.4 Result overview, VP3

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

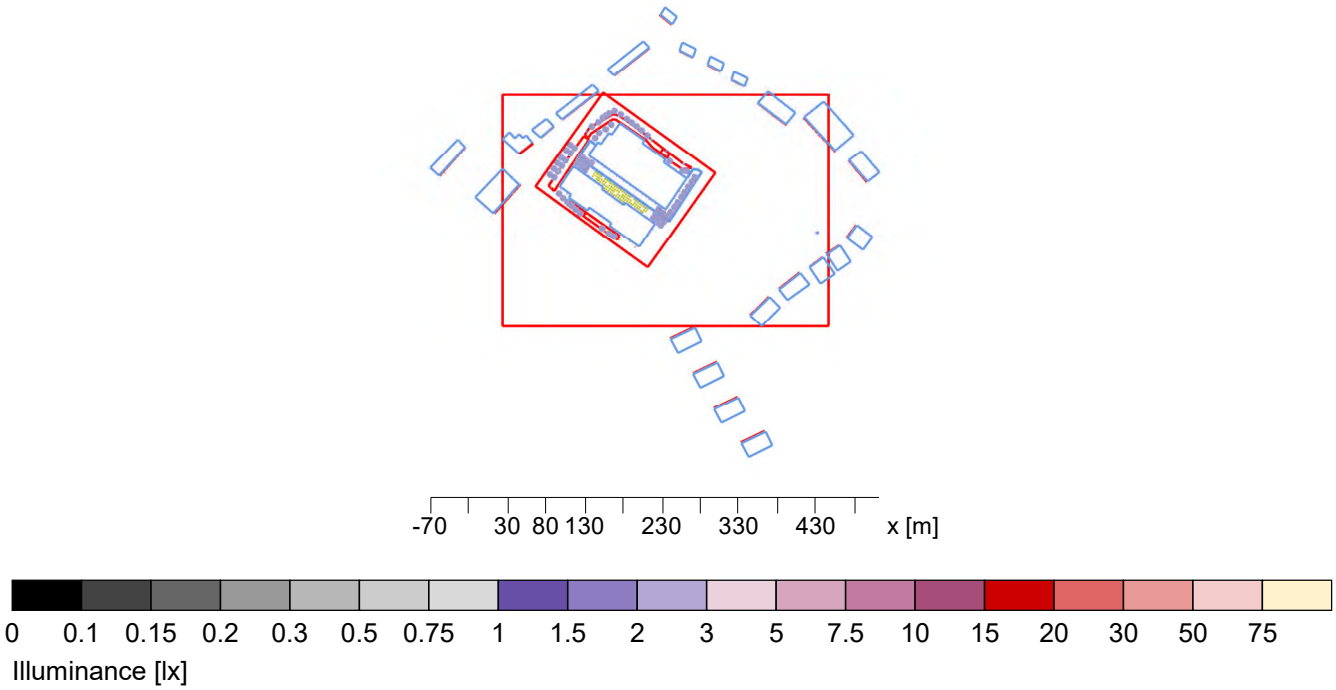
GRIVEN

4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.5 Result overview, VP4



General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.01 lx
Minimum illuminance	E_{min}	0 lx
Maximum illuminance	E_{max}	0.03 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:--- (---)
Diversity U_d	E_{min}/E_{max}	1:--- (---)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.5 Result overview, VP4

2 7 x
Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x
Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

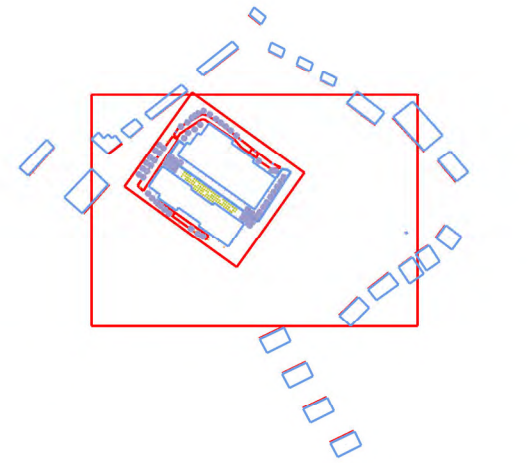
5 112 x
Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

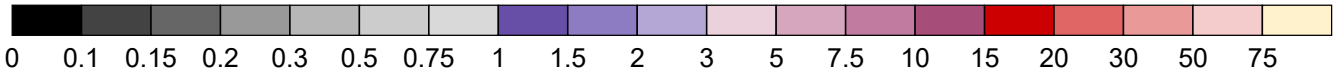
GRIVEN

4 62 x
Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.6 Result overview, VP5





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.08 lx
Minimum illuminance	E_{min}	0.08 lx
Maximum illuminance	E_{max}	0.09 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.09 (0.92)
Diversity U_d	E_{min}/E_{max}	1:1.18 (0.85)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.6 Result overview, VP5

2 7 x
Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x
Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

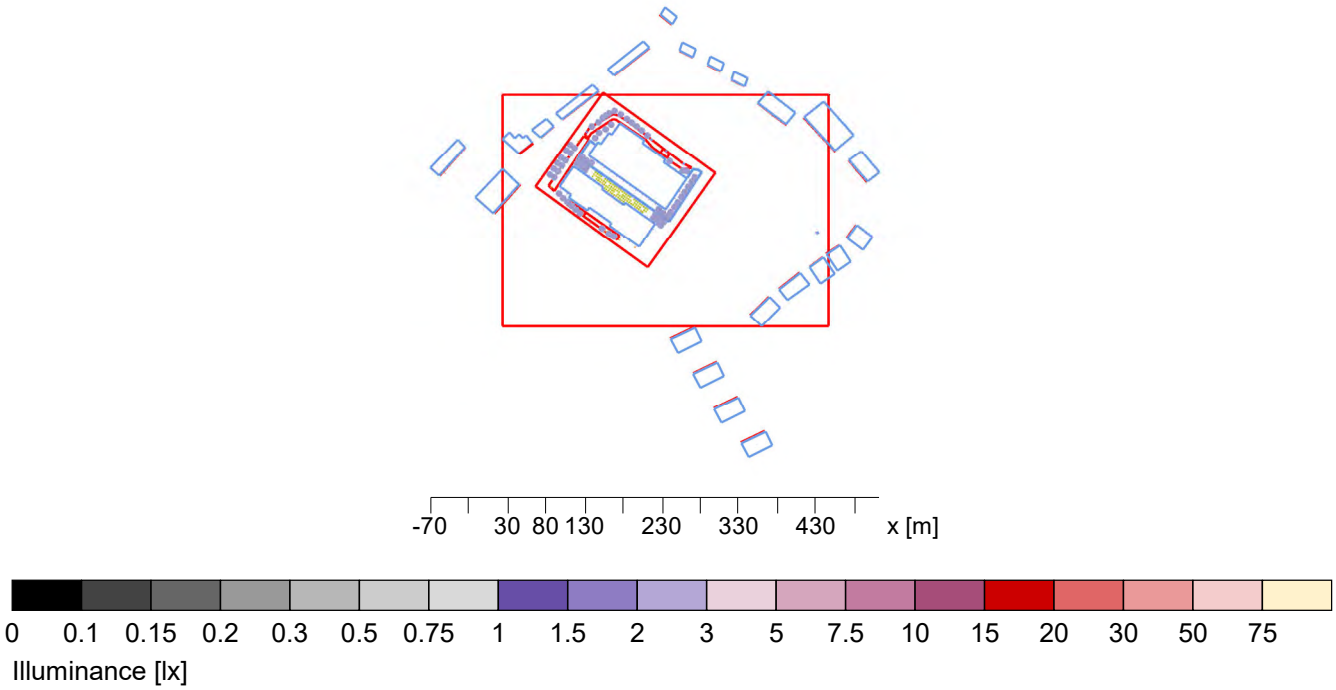
5 112 x
Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

GRIVEN

4 62 x
Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.7 Result overview, VP6



General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.07 lx
Minimum illuminance	E_{min}	0.06 lx
Maximum illuminance	E_{max}	0.07 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.07 (0.93)
Diversity U_d	E_{min}/E_{max}	1:1.13 (0.89)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.7 Result overview, VP6

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

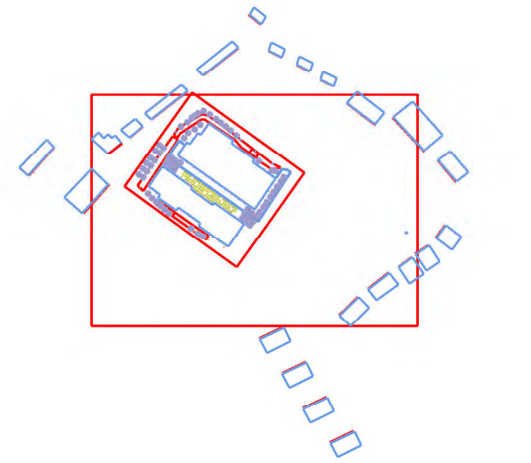
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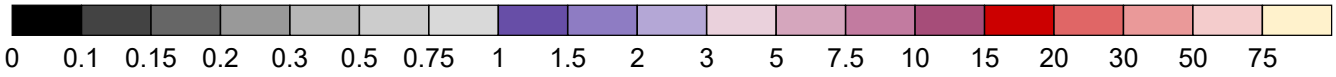
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.8 Result overview, VP7





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.05 lx
Minimum illuminance	E_{min}	0.05 lx
Maximum illuminance	E_{max}	0.06 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.07 (0.93)
Diversity U_d	E_{min}/E_{max}	1:1.15 (0.87)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.8 Result overview, VP7

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

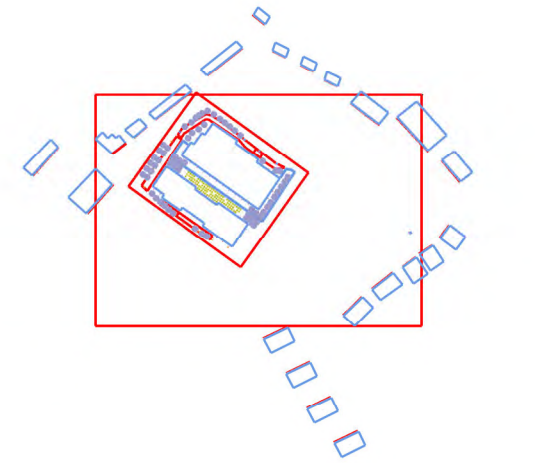
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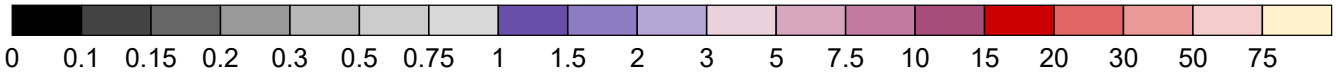
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.9 Result overview, VP8





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.04 lx
Minimum illuminance	E_{min}	0.04 lx
Maximum illuminance	E_{max}	0.05 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.09 (0.92)
Diversity U_d	E_{min}/E_{max}	1:1.15 (0.87)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.9 Result overview, VP8

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

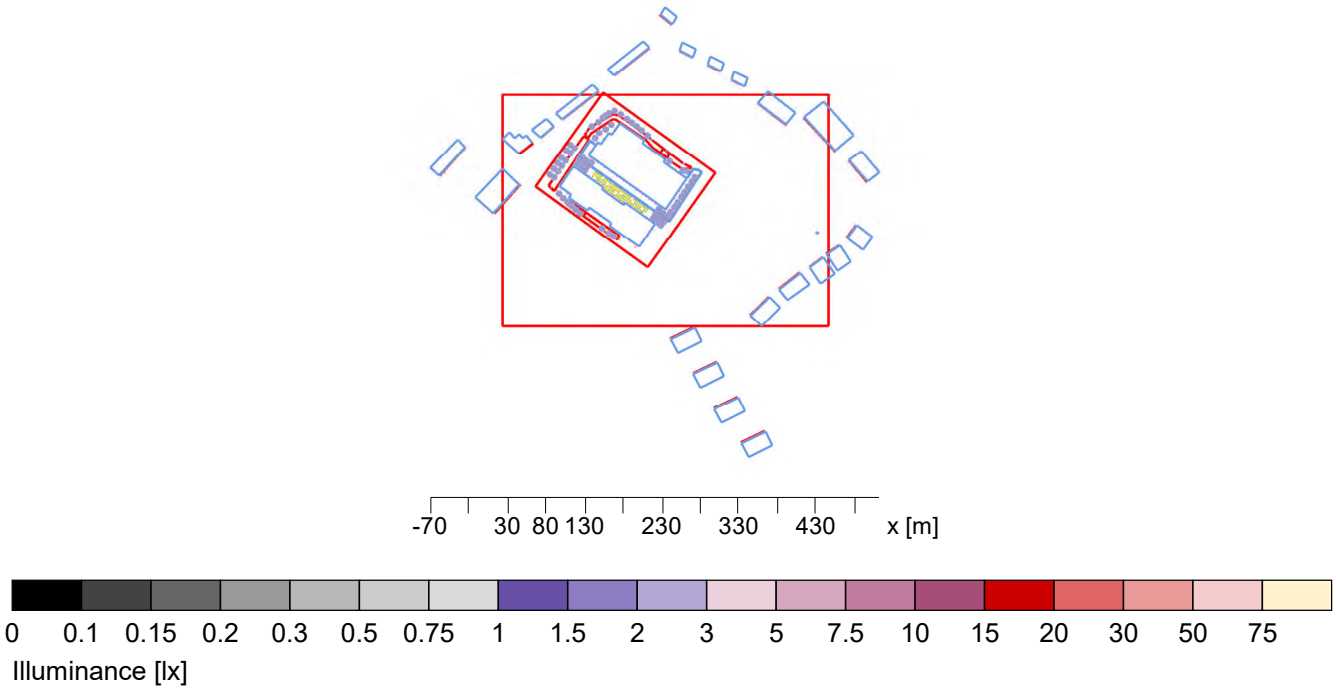
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4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.10 Result overview, VP9



General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.05 lx
Minimum illuminance	E_{min}	0.04 lx
Maximum illuminance	E_{max}	0.05 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.15 (0.87)
Diversity U_d	E_{min}/E_{max}	1:1.22 (0.82)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.10 Result overview, VP9

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

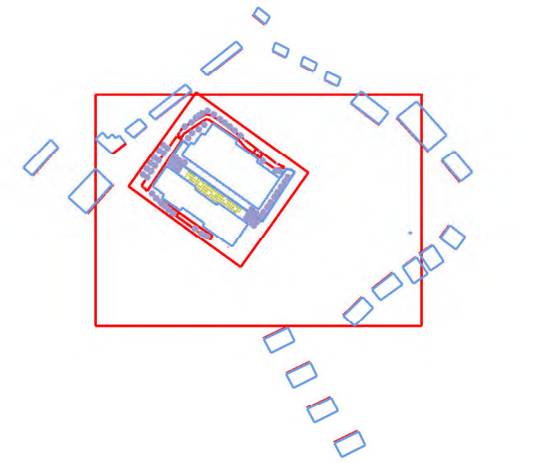
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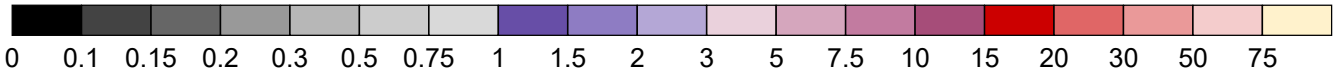
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.11 Result overview, VP10





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.04 lx
Minimum illuminance	E_{min}	0.04 lx
Maximum illuminance	E_{max}	0.05 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.13 (0.89)
Diversity U_d	E_{min}/E_{max}	1:1.26 (0.79)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.11 Result overview, VP10

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

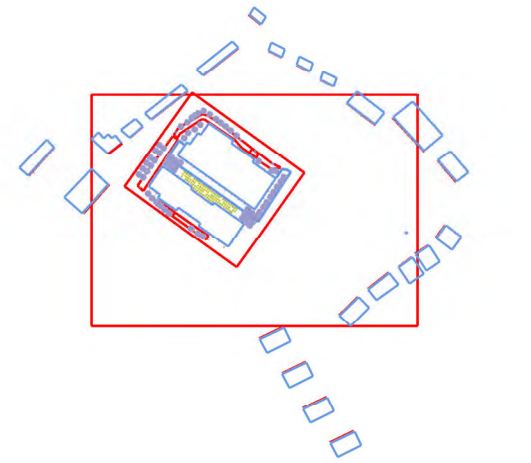
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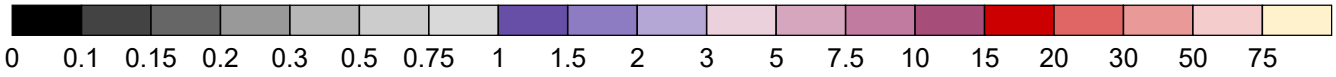
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.12 Result overview, VP11





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.07 lx
Minimum illuminance	E_{min}	0.05 lx
Maximum illuminance	E_{max}	0.07 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.4 (0.71)
Diversity U_d	E_{min}/E_{max}	1:1.62 (0.62)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.12 Result overview, VP11

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

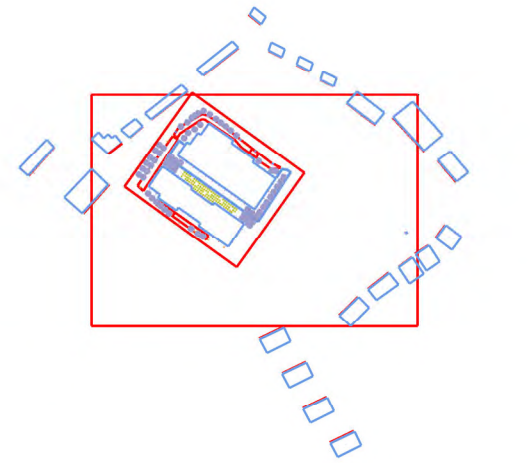
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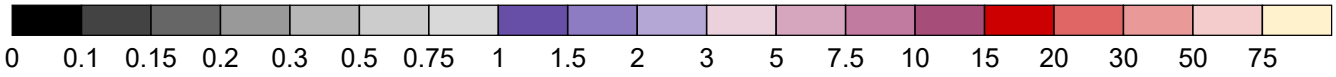
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.13 Result overview, VP12





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.11 lx
Minimum illuminance	E_{min}	0.09 lx
Maximum illuminance	E_{max}	0.12 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.22 (0.82)
Diversity U_d	E_{min}/E_{max}	1:1.39 (0.72)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.13 Result overview, VP12

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

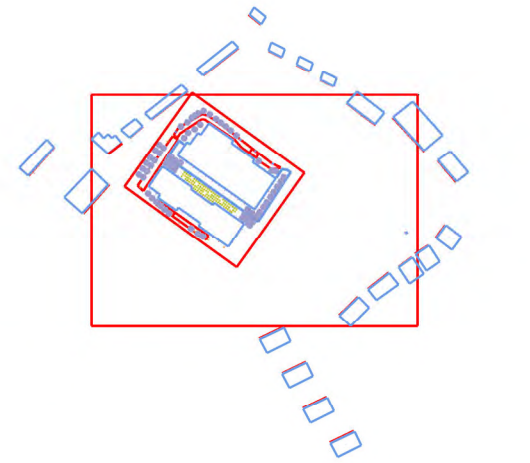
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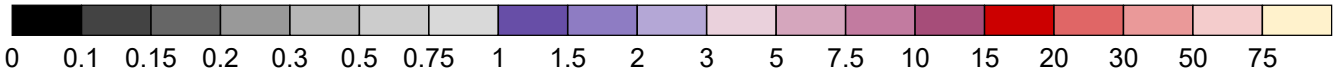
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.14 Result overview, VP13





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.13 lx
Minimum illuminance	E_{min}	0.12 lx
Maximum illuminance	E_{max}	0.15 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.11 (0.9)
Diversity U_d	E_{min}/E_{max}	1:1.21 (0.82)

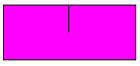
Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.14 Result overview, VP13

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

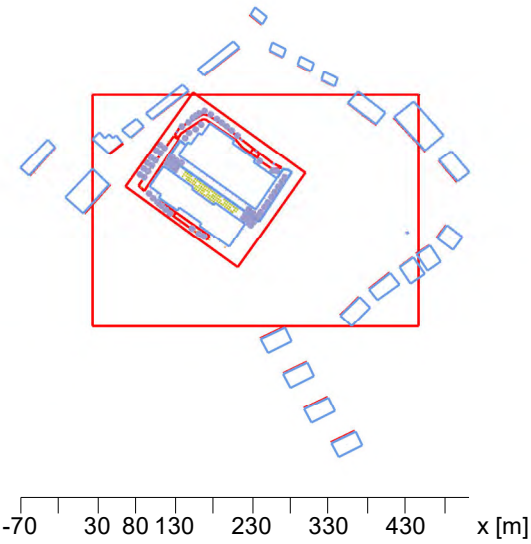
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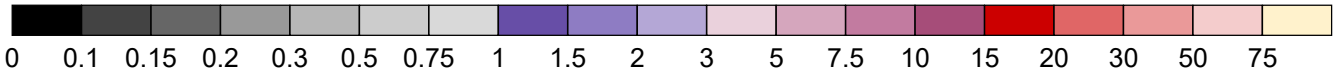
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.15 Result overview, VP14





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.17 lx
Minimum illuminance	E_{min}	0.16 lx
Maximum illuminance	E_{max}	0.18 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.07 (0.93)
Diversity U_d	E_{min}/E_{max}	1:1.13 (0.89)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.15 Result overview, VP14

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

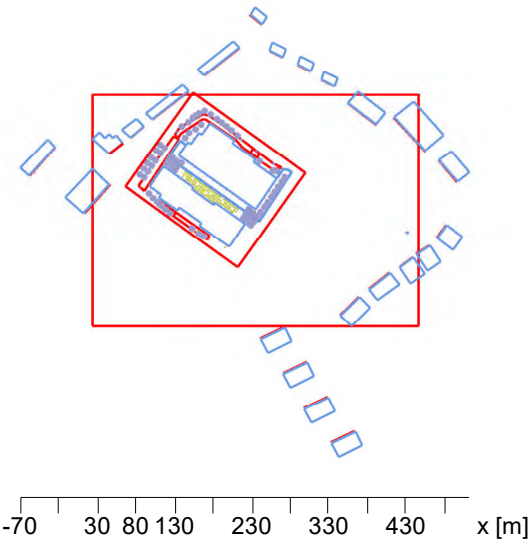
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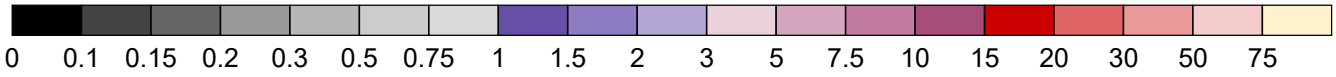
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.16 Result overview, VP15





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.19 lx
Minimum illuminance	E_{min}	0.18 lx
Maximum illuminance	E_{max}	0.19 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.05 (0.96)
Diversity U_d	E_{min}/E_{max}	1:1.07 (0.94)

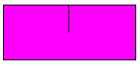
Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.16 Result overview, VP15

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

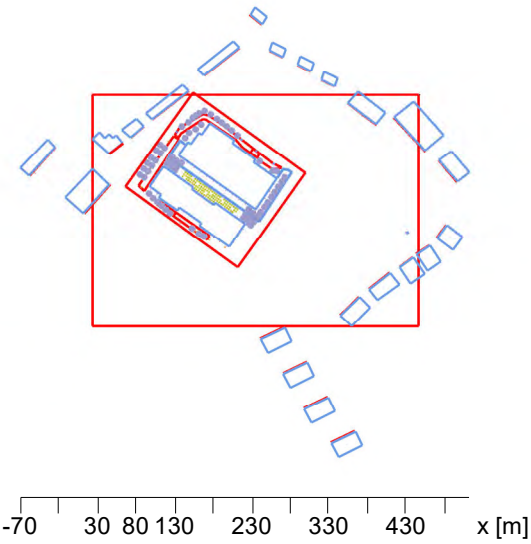
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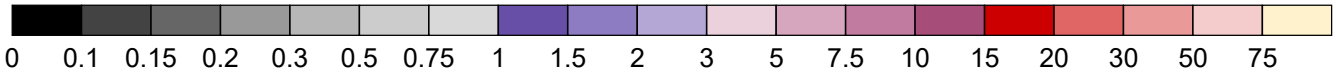
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.17 Result overview, VP16





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.1 lx
Minimum illuminance	E_{min}	0.08 lx
Maximum illuminance	E_{max}	0.12 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.32 (0.76)
Diversity U_d	E_{min}/E_{max}	1:1.58 (0.63)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.17 Result overview, VP16

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

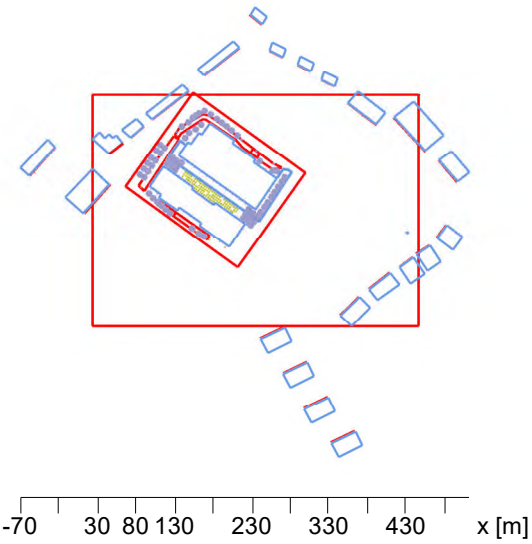
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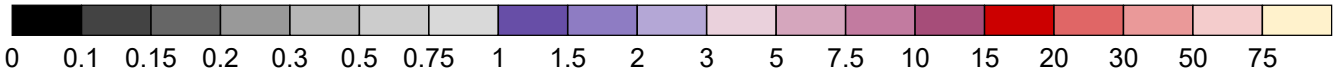
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.18 Result overview, VP17





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.21 lx
Minimum illuminance	E_{min}	0.14 lx
Maximum illuminance	E_{max}	0.29 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.52 (0.66)
Diversity U_d	E_{min}/E_{max}	1:2.15 (0.47)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.18 Result overview, VP17

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

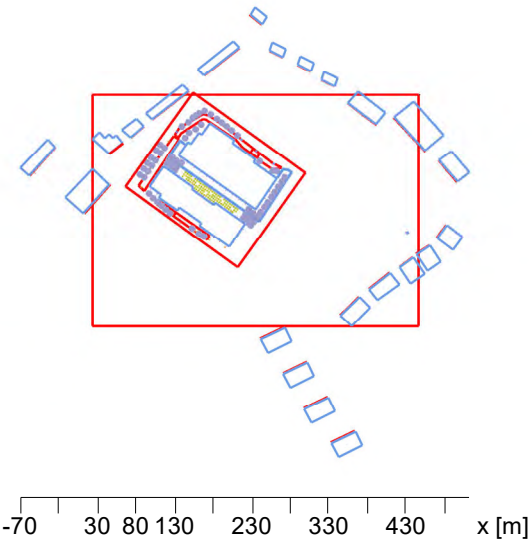
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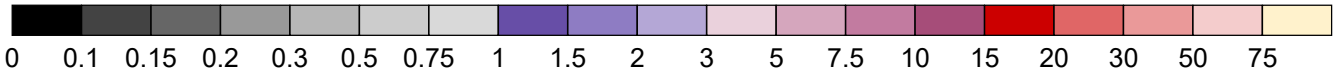
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.19 Result overview, VP18-19





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.53 lx
Minimum illuminance	E_{min}	0.34 lx
Maximum illuminance	E_{max}	0.71 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.57 (0.64)
Diversity U_d	E_{min}/E_{max}	1:2.12 (0.47)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.19 Result overview, VP18-19

2 7 x
Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x
Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

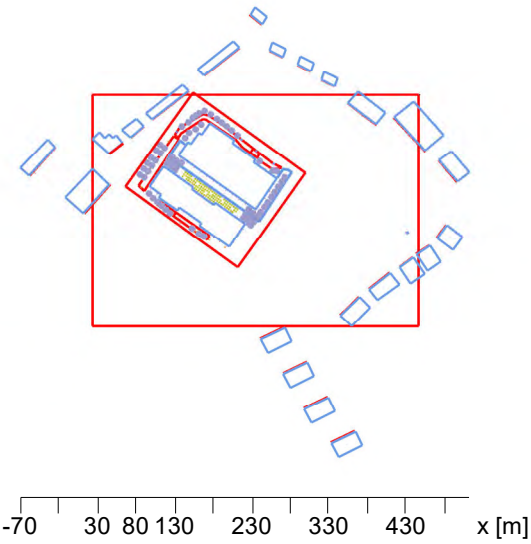
5 112 x
Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

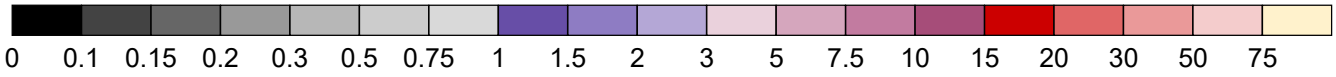
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4 62 x
Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.20 Result overview, VP20





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.66 lx
Minimum illuminance	E_{min}	0.57 lx
Maximum illuminance	E_{max}	0.72 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.16 (0.86)
Diversity U_d	E_{min}/E_{max}	1:1.27 (0.79)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.20 Result overview, VP20

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

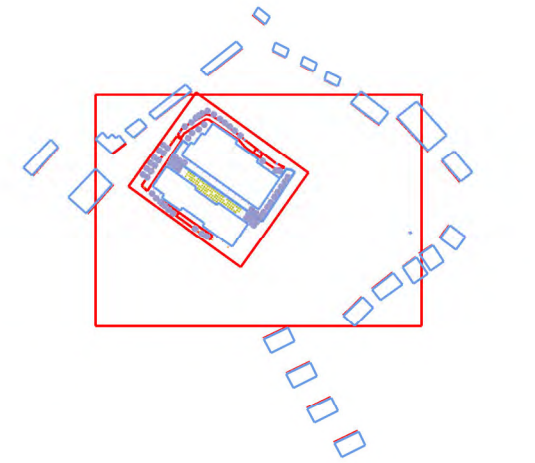
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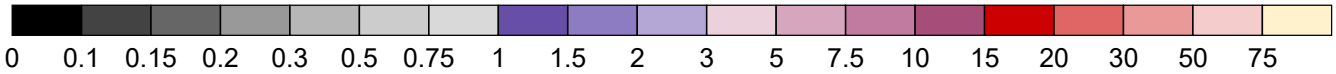
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.21 Result overview, VP21





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.44 lx
Minimum illuminance	E_{min}	0.34 lx
Maximum illuminance	E_{max}	0.53 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.29 (0.78)
Diversity U_d	E_{min}/E_{max}	1:1.55 (0.65)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.21 Result overview, VP21

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

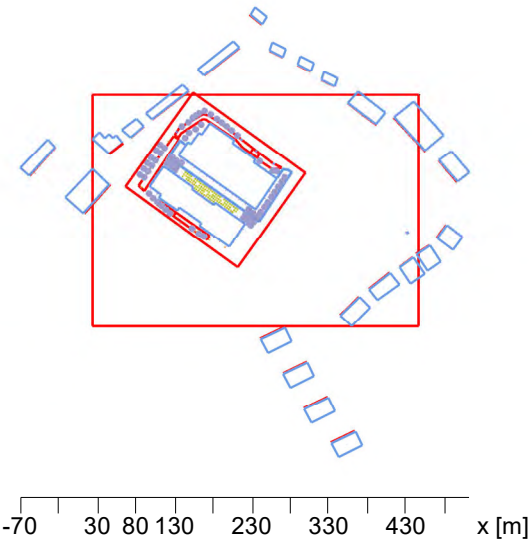
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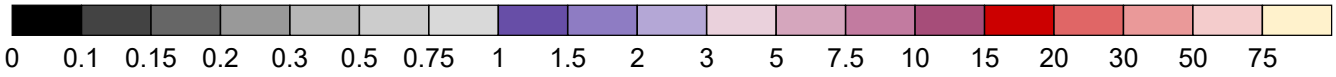
4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.22 Result overview, VP22-23





Illuminance [lx]

General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.05 lx
Minimum illuminance	E_{min}	0.02 lx
Maximum illuminance	E_{max}	0.11 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:2.86 (0.35)
Diversity U_d	E_{min}/E_{max}	1:6.73 (0.15)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.22 Result overview, VP22-23

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

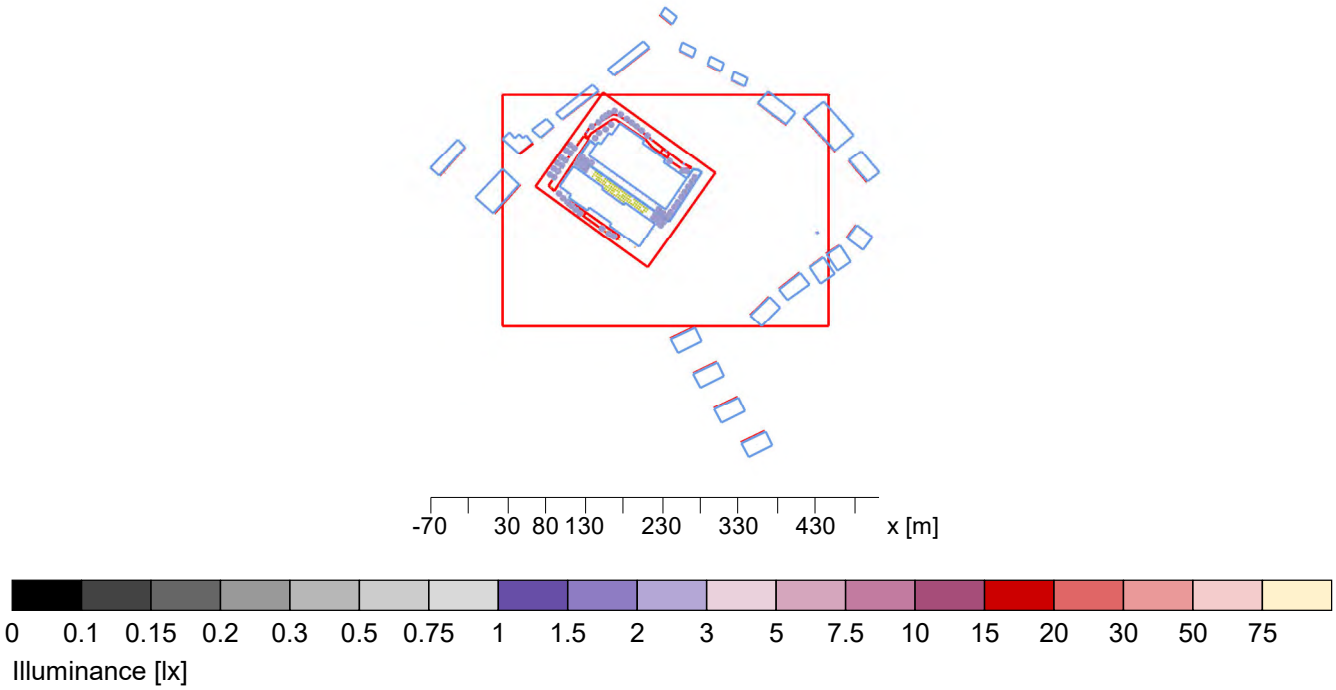
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4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.23 Result overview, VP24



General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.23 lx
Minimum illuminance	E_{min}	0.13 lx
Maximum illuminance	E_{max}	0.37 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.71 (0.58)
Diversity U_d	E_{min}/E_{max}	1:2.84 (0.35)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.23 Result overview, VP24

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

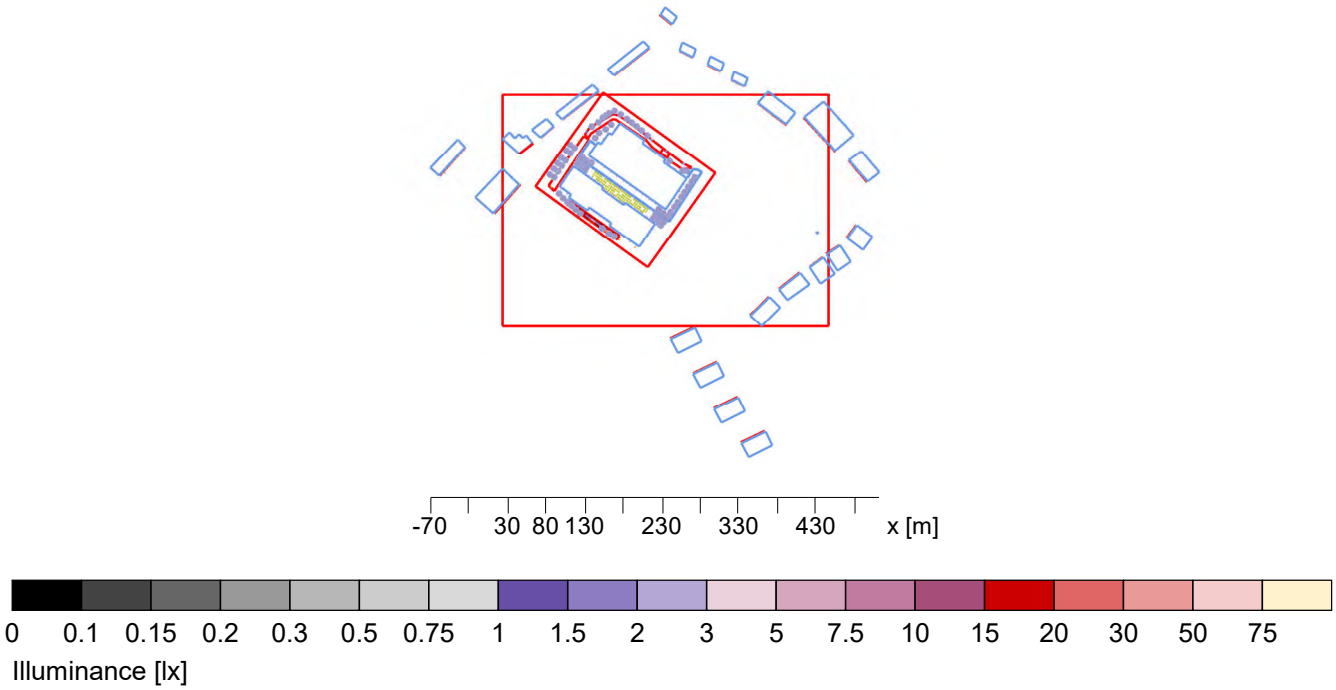
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4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.24 Result overview, Walkways for pedestrians



General

Calculation algorithm used	Average indirect fraction
Height of evaluation surface	0.00 m
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)

(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)

Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	8.2 lx
Minimum illuminance	E_{min}	1.4 lx
Maximum illuminance	E_{max}	94.5 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:6.06 (0.17)
Diversity U_d	E_{min}/E_{max}	1:69.5 (0.01)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.24 Result overview, Walkways for pedestrians

2 7 x
Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x
Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

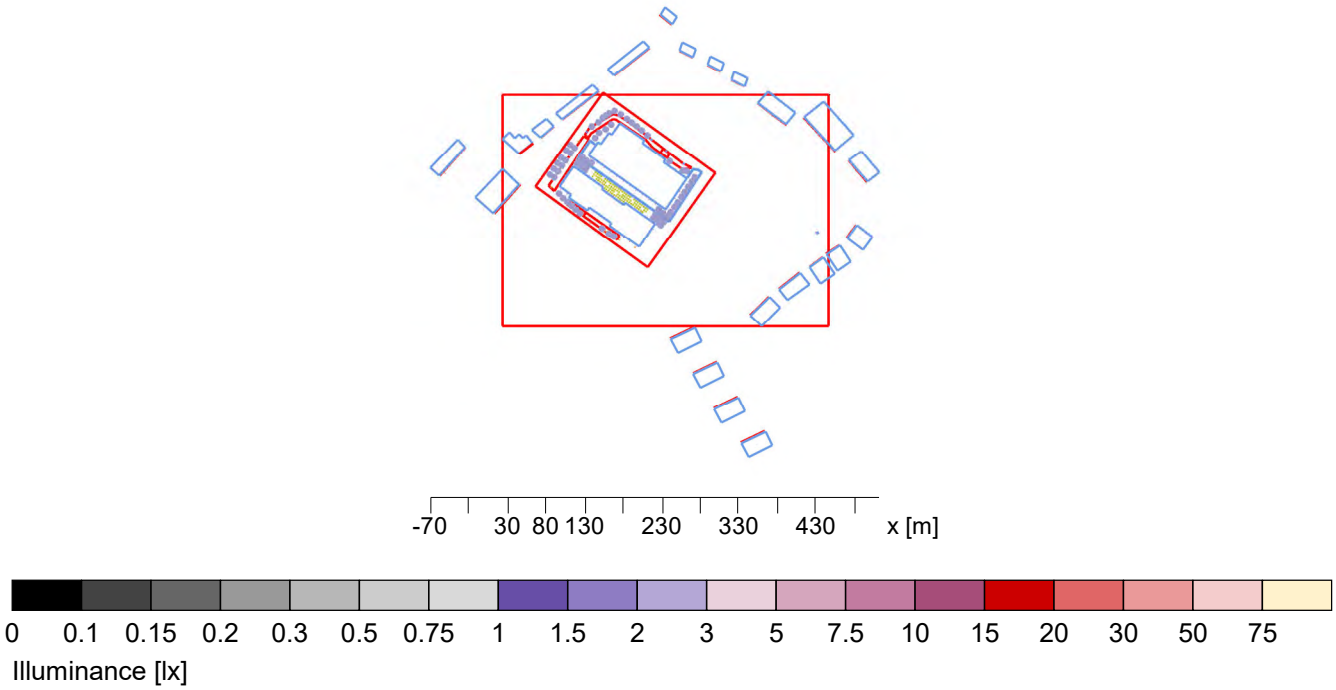
5 112 x
Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

GRIVEN

4 62 x
Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

2.2 Summary, Exterior 1

2.2.25 Result overview, Potential BAT location



General

Calculation algorithm used	Average indirect fraction
Maintenance factor	0.70
Total luminous flux	565698.625 lm (dimmed to 94.39%)
(Luminaires have been dimmed. For details see output page "Luminaire data/Room elements".)	
Total power	6061.8 W
Total power per area (126961.25 m²)	0.05 W/m²
Upward light ratio (RUL)	0.21

Illuminance

Average illuminance	$\bar{E}_m$	0.08 lx
Minimum illuminance	E_{min}	0.07 lx
Maximum illuminance	E_{max}	0.08 lx
Uniformity U_o	$E_{min}/\bar{E}_m$	1:1.01 (0.99)
Diversity U_d	E_{min}/E_{max}	1:1.02 (0.98)

Type No.\Make

		WE-EF;Eulumdat2	
1	86 x	Order No.	: 185-3319
		Luminaire name	: ETC109 VA:IP68:LED-4/0,5W;ETC109, Inground Luminaires
		Equipment	: 4 x LED-4/0,5W/830 white - 3000K / 3.25 lm

The ULR value has been calculated without obstruction by other objects.

2.2 Summary, Exterior 1

2.2.25 Result overview, Potential BAT location

2 7 x

Order No. : 102-0346
Luminaire name : AFL120-WL [S71] IP66:LED-8/8W/2200K - 16/32W/3000K;AFL120-WL, Street and Area
Equipment : 16 x LED-16/32W - 3000K / 290 lm

3 15 x

Order No. : 116-0207
Luminaire name : LTP444 IP44:LED-FT-37W/3K;LTP444 LED, Light Columns
Equipment : 1 x LED-FT-37W/830 - 3000K 42 W / 6380 lm

5 112 x

Order No. : 185-7593
Luminaire name : ETC120-GB [EE] VA:IP67:LED-3/6W/3K;ETC120 GB LED, Inground Luminaires
Equipment : 3 x LED-3/6W/830 - 3000K / 290 lm

GRIVEN

4 62 x

Order No. : AL5005ELWW
Luminaire name : Capital 100 Elliptical WW
Equipment : 1 x White LEDs 69 W / 6009 lm

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