Cardiff and Vale College - Barry Waterfront Campus

BWC-ARUP-XX-XX-RP-OL-000001 | RIBA Stage 4 External Lighting Report

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Contents

Introduction

Welcome to the Cardiff and Vale College (CAVC), Barry Waterfront Campus (BWC) external lighting report. The objective of this report is to set out the lighting strategy, lighting considerations and limiting lighting criteria for consideration at detailed planning.

The report will cover the following:

- Site Context - a breakdown of the scope and routes around the site to determine the lighting strategy.
- Lighting Strategy - the lighting treatments for each location throughout the planned development and the reasons those treatments are selected.
- Lighting Principles - some of the key details that shall be applied when adopting the different lighting treatments.
- Design Criteria - the limiting lighting design criteria based on reference to ecological guidelines, British Standards and best practice guidelines.
- Indicative Layouts - the plans showing indicative luminaire positions and quantities.
- Lighting Schedule - a list of indicative type luminaires for specification.
- Control Strategy - lighting control considerations for development in latter design phases.

Figure 1: Visual extract of BWC by Sheppard Robson

1 Site Context

1.1 Wider Site Context

The site is in suburban Barry as shown in Figure 2. Figure 3 identifies the prevalent surrounding features of the site:

- Commercial, Retail and Residential to the North
- Ffordd Y Mileniwm to the East and South East
- Primary School Site to the South
- Car Park and Freight Sidings to the West

Figure 2: Site location with the proposed site highlighted in red.

Figure 3: Site context with the proposed site highlighted in red.

1.2 Sensitive Receptors

1.2.1 Local Residences

Local residence to the North-east of the site. Any lighting proposal shall consider the impact of intrusive light to properties as per the Institute of Lighting Professional (ILP) Guidance Note 01/21(GN01) for the reduction of obtrusive light. Please refer to section “4 Design Criteria” within this report for further details.

Figure 4: Identification sensitive receptors.

1.3 Site Movement and Activity

Access routes define the lighting approach within an exterior/public realm scheme, providing the basis for the visual lighting hierarchy and to inform the proposed illuminance levels around the site.

The access routes have been assessed and determined based on the following:

- What the route used for
- Who uses the route
- How often the route is used

The routes have been broken down into the following categories:

1.3.1 Primary Vehicular Route

The route is predicted have regular vehicular access, with vehicles travelling <30mph. The route is expected to be busy between peak college hours (drop off and collection) and quiet thereafter.

1.3.2 Primary Pedestrian Route

Primary pedestrian routes are predicted to have high foot-fall, being used by students, staff and visitors. These routes are primarily to gain access to the main entrances of buildings and dwell locations.

1.3.3 Secondary Pedestrian Route

Secondary routes are predicted to have less foot-fall and used less frequently. The secondary routes primarily provide access through the dwell areas and to secondary building entrances.

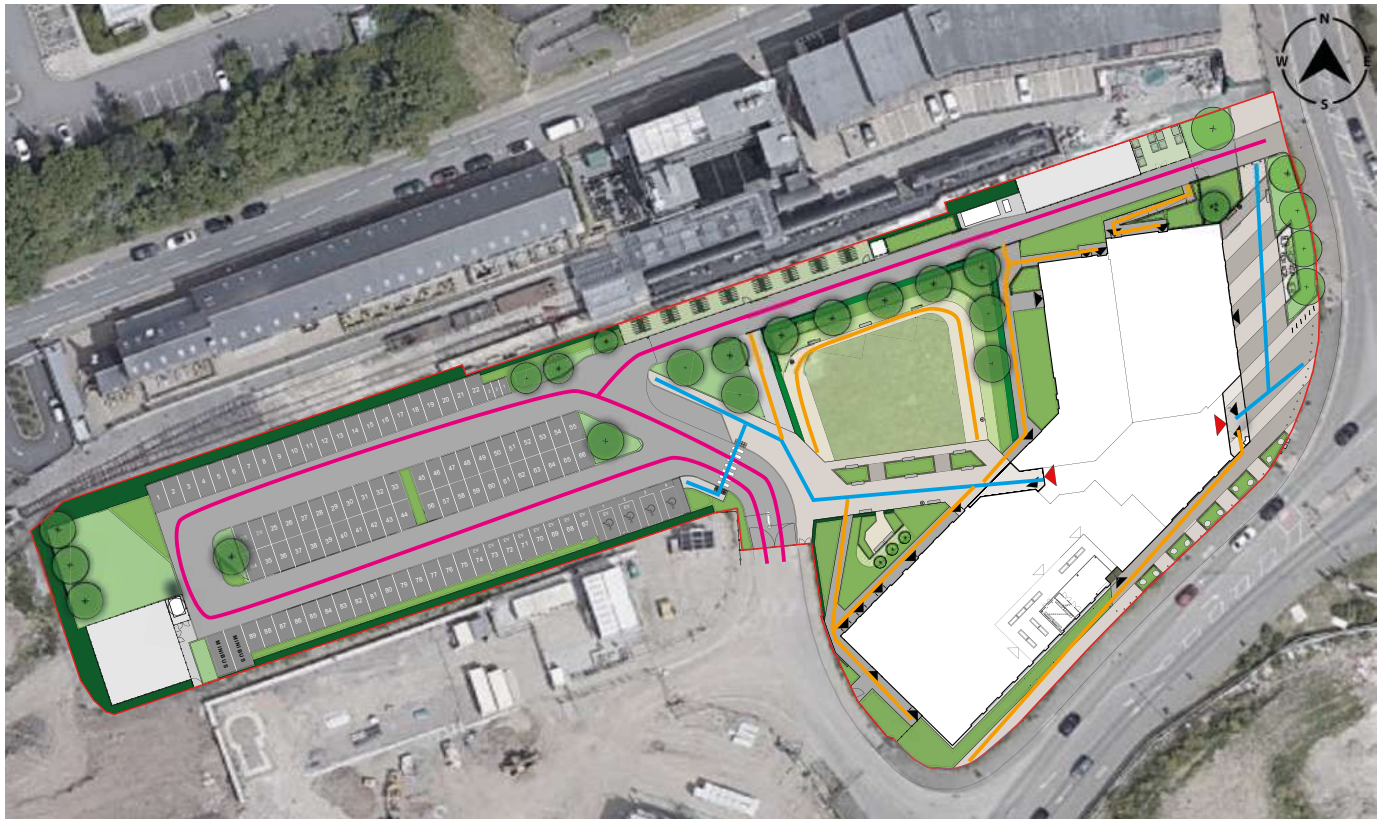


Figure 5: Movement plan

Site Movement and Activity

In addition to the access routes, the individual spaces along those routes need to be considered holistically. This approach ensures the lighting treatments and illuminance levels blend seamlessly from area to area based on function and use.

Further categories from those listed previously are as follows:

1.3.4 Pedestrian Route - Dwell

A dwell space is an area that is anticipated to be used for students and visitors to socialise during daytime and night-time. P3 is a lighting class categorisation within BS EN 13201-2: 2015 Road Lighting, Selection of Lighting Classes in conjunction with BS EN 12464-2 Light and lighting — Lighting of work places, Part 2: Outdoor work places that recommends the illuminance level for that area.

1.3.5 Building Entrances/Exits & Main Approach

Building entrances shall be the brightest visual statement within the public realm. As the brightest point, they help guide people around the public realm and are easily identifiable landmarks. Well illuminated entrances are critical for way-finding and inclusivity for all users.

1.3.6 Car Park Spaces

Lighting to the car park areas will be functional focussing on illuminating a wide area utilising as few luminaires as possible.

1.3.7 Accessible Car Park Spaces

As above but illuminated to a higher level, following the guidance of BS 8300-1:2018. This is to assist with manual and visual tasks.

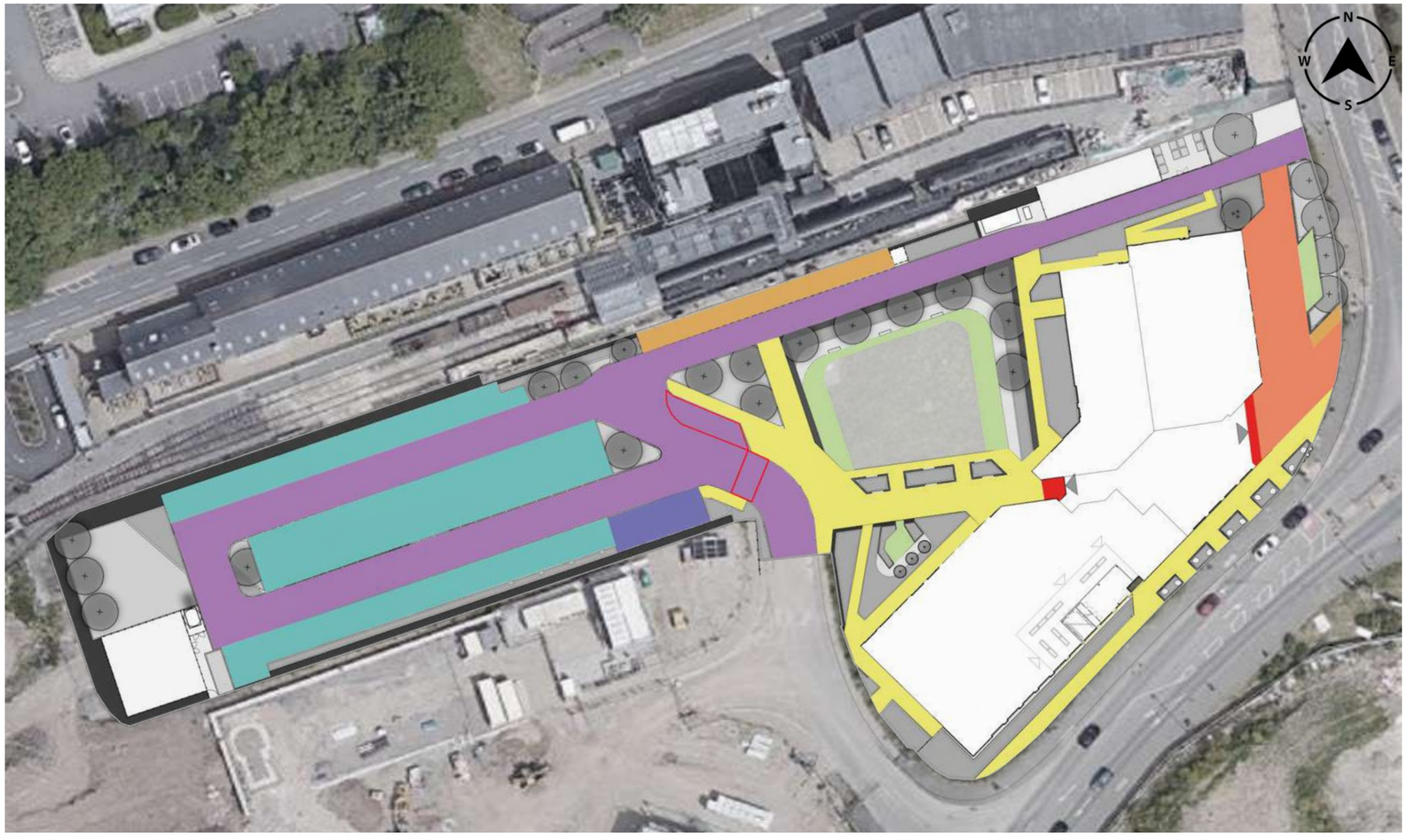


Figure 6: Area Categorisation Plan

- Main approach
- Main building entrances
- Dwell areas
- Pedestrian route
- Bike storage
- Vehicular route
- Accessible parking
- Conflict areas
- Car parking

2 Lighting Strategy

2.1 Lit Environment

The lighting strategy focuses on several key aspects:

1. Provide functional lighting - to the mixed vehicular, pedestrian and cyclist routes, car parks, loading/unloading bays, and security.

2. Promoting routes - using lighting intensity, equipment height and type to direct movement and aid way-finding around the college.

3. Provide a safe, comfortable experience - with an external ambience appropriate for the use of the site.

4. A balanced light transition - between areas to avoid extremes in contrast.

5. Encourage dwelling - and socialising in external locales.

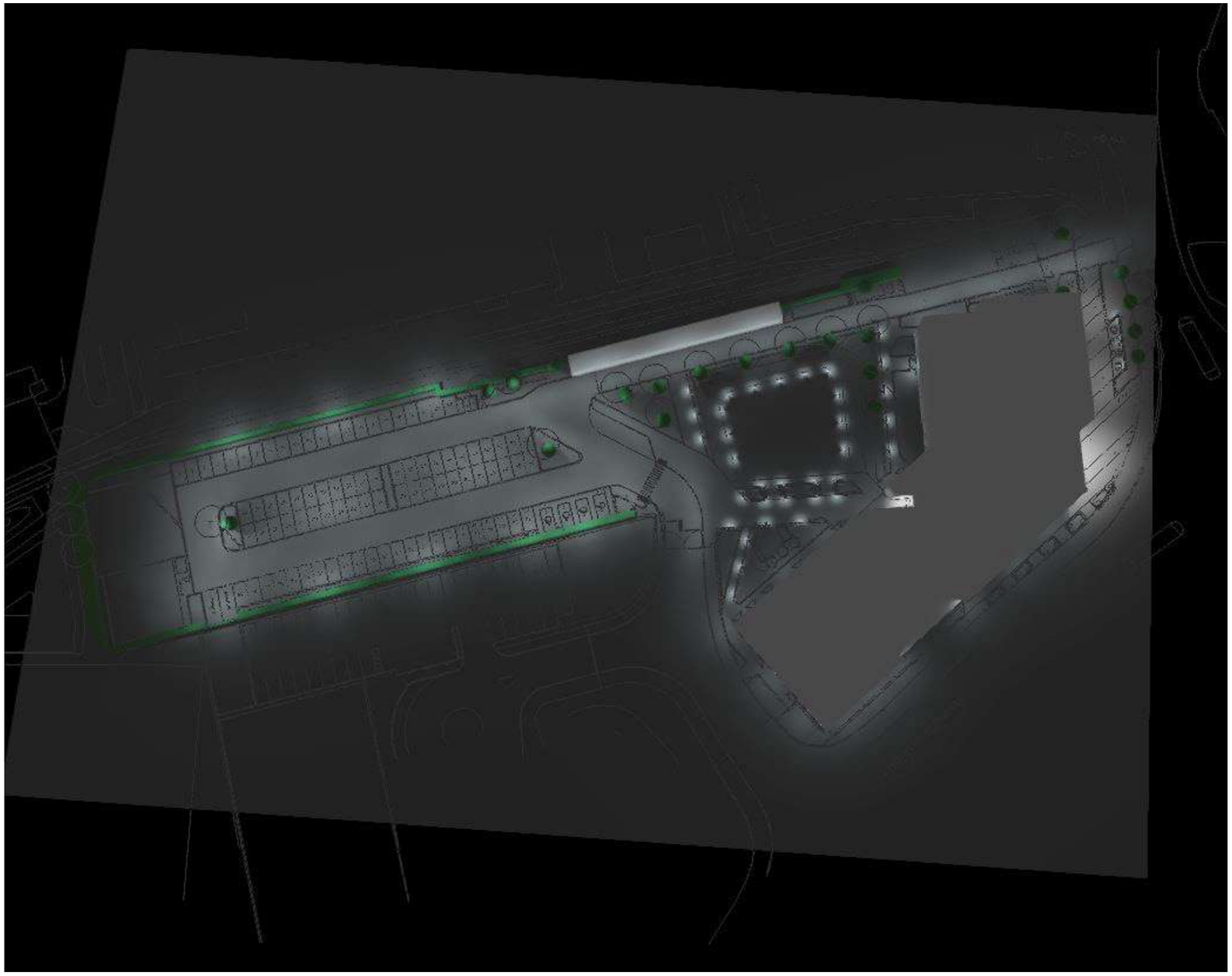


Figure 7: Lighting visualisation

2.2 Vehicular Routes

Including Car Parks, Accessible Spaces and Conflict Areas

- Pole top luminaires - Pole top luminaire attached to a 6m column with various outputs and light distributions across the site to provide the base lighting levels. Please refer to section "6 Lighting Schedule" for luminaire details.

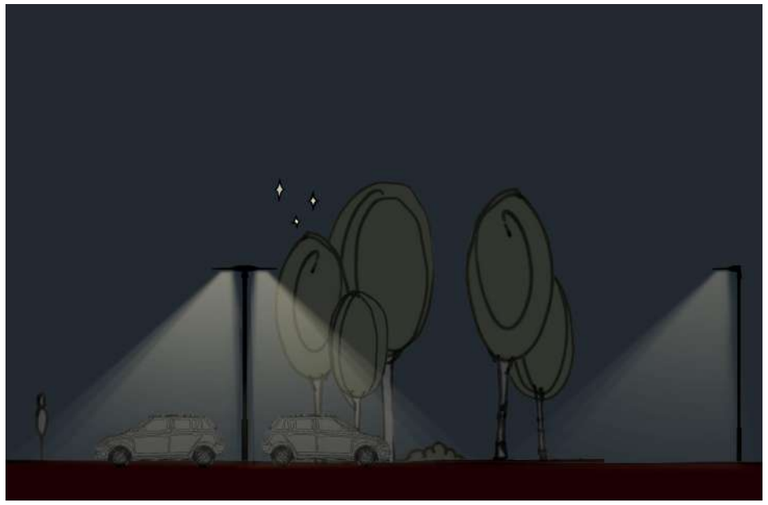


Figure 8: Lighting concept - vehicular routes and parking areas

Figure 10: Kaiser San Diego Central Hospital© Arup

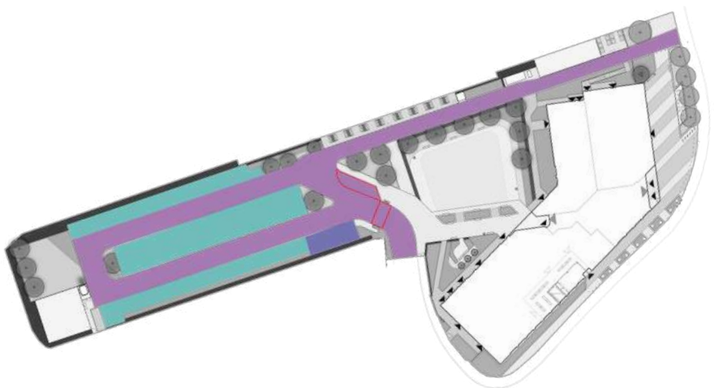
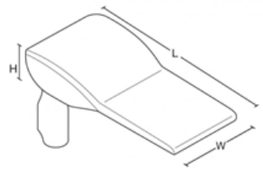


Figure 11: Key Plan

Luminaire type EXA, EXB & EXC



558mm(l) x 293mm (w) x 115mm (h

Figure 9: Indicative luminaire image and dimensions

2.3 Pedestrian and Cyclist Routes

Including Cycle Shelters

- Pole top luminaires - Pole top luminaire attached to a 6m column with various outputs and light distributions across the site to provide the base lighting levels. Please refer section "6 Luminaire Schedule" for more information on each luminaire type.
- Linear luminaire - linear batten with a wide distribution mounted to the soffit of enclosed cycle shelters for area lighting.
- Wall mounted luminaires - luminaire with forward throw distribution mounted at 3 -6 m across the building perimeter. Luminaires situated above secondary entrances to aid wayfinding. Final exits for escape routes will require integrated emergency luminaires.
- Bollards - low-level bollards located within the dwell areas among planters and benches to provide a comfortable ambience.

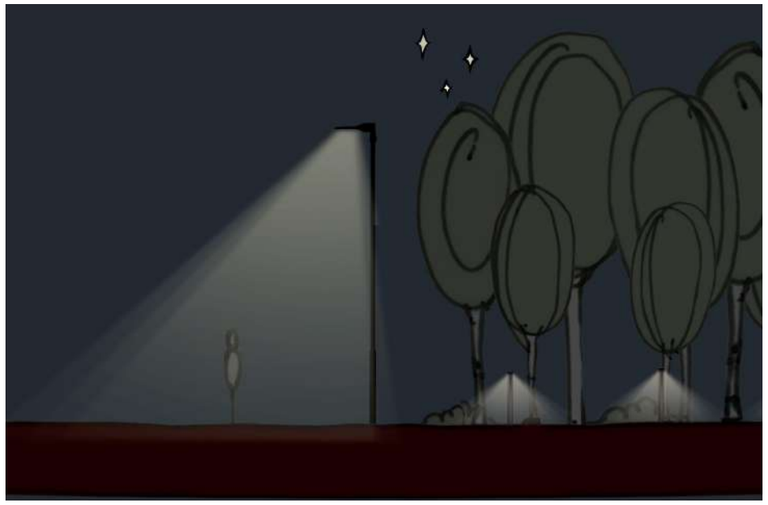


Figure 12: Lighting concept

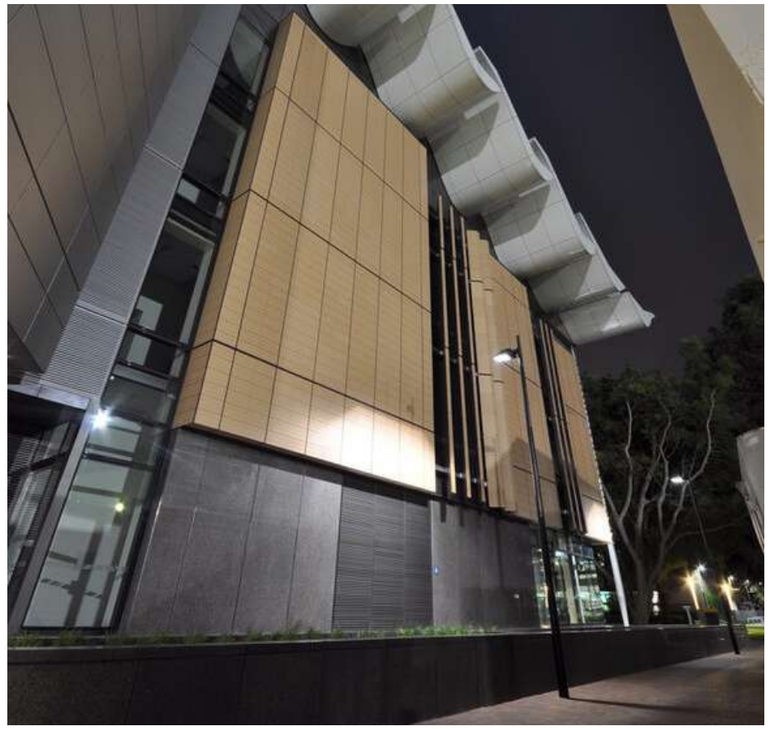
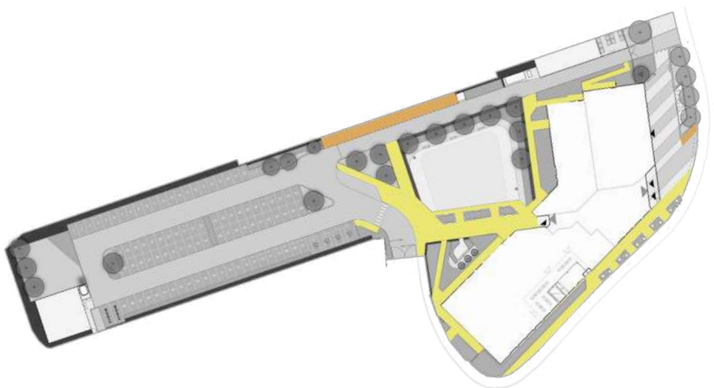


Figure 14: Column lighting reference image - Technology Building University of New South Wales © Arup

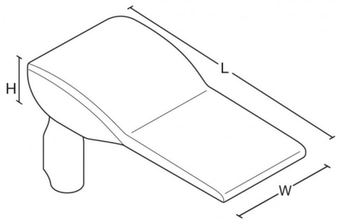


Pedestrian route

Bike shelter

Figure 15: Key Plan

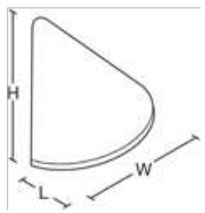
Luminaire type EXA, EXB, EXC



558mm(l) x 293mm (w) x 115mm (h)

Luminaire type EXJ
658mm(l) x 145mm (w) x 101mm (h)

Luminaire type EXE



224mm(l) x 375mm (w) x 329mm (h)

Luminaire type EXF

648mm(h) x 152mm (dia)

Figure 13: Indicative luminaire image and dimensions

2.4 Dwell Areas and Entrances

- Pole top luminaires - Circular pole top luminaire attached to a 4m column with a symmetrical light distribution. The different aesthetic helps identify the main approach to the site and building.
- Bollards - low-level bollards located within the dwell areas among planters and benches to provide a comfortable ambience.
- Downlights - recessed downlights with a wide distribution mounted to the soffit of the main entrance canopies to provide higher levels of horizontal illuminance and good vertical illuminance above entrance doors.

  Please refer to section "6 Lighting Schedule" for full luminaire details.

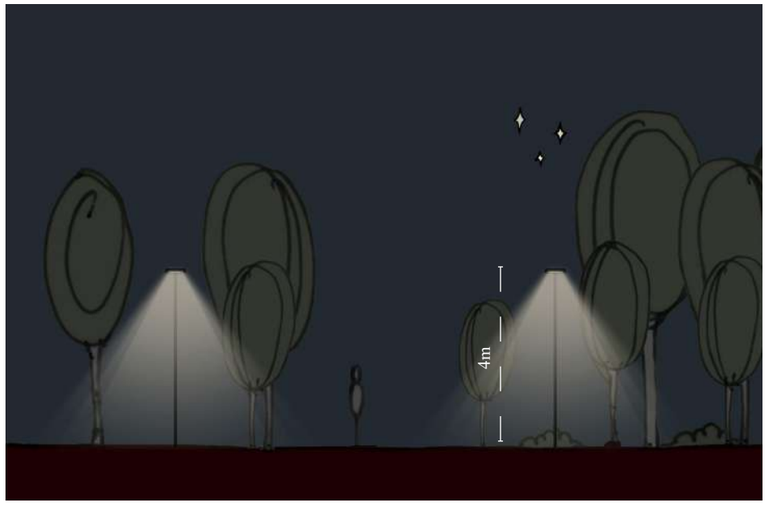
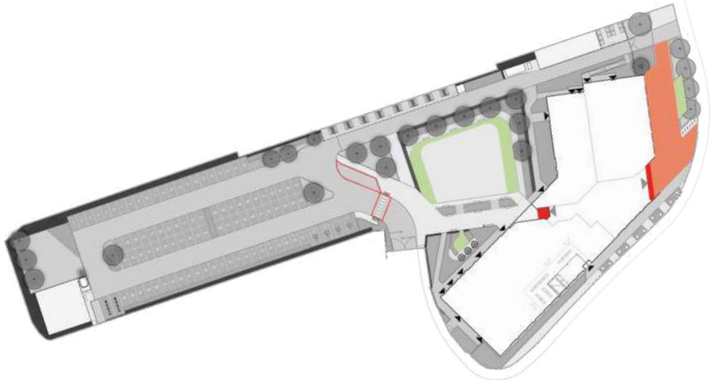


Figure 16: Lighting concept

Figure 17: Precedent Image - downlights to canopy



Main approach

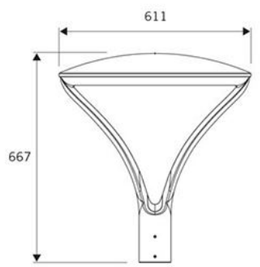
Main building entrances

Dwell areas

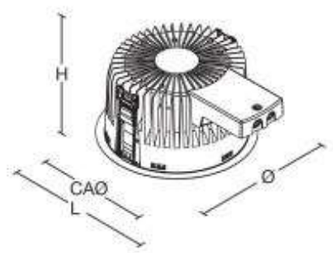
Figure 20: Key Plan

Luminaire type EXF

Luminaire type EXH



Luminaire type EXG



270mm(l) x 220mm (w) x 147mm (h)

Figure 18: Indicative luminaire image and dimensions

Figure 19: Precedent image - © Holophane

3 Lighting Principles

3.1 Column Mounted Lighting

3.1.1 Luminaire Selection

The luminaire selection for column mounted lighting have been carefully selected considering the following criteria:

- Optical control - beam angles/beam shaping
- Tilt - only 0° is acceptable to prevent impact to ecology. Refer to Figure 21.
- Glare control - back shields on columns adjacent to the railway and residential properties to limit light spill onto these areas. Please refer to Figure 22.
- Column height - 6m is recommended to limit visual impact while providing a wide distribution of lighting using fewer luminaires.

Figure 21: Luminaire with 0° tilt to prevent upward light spill

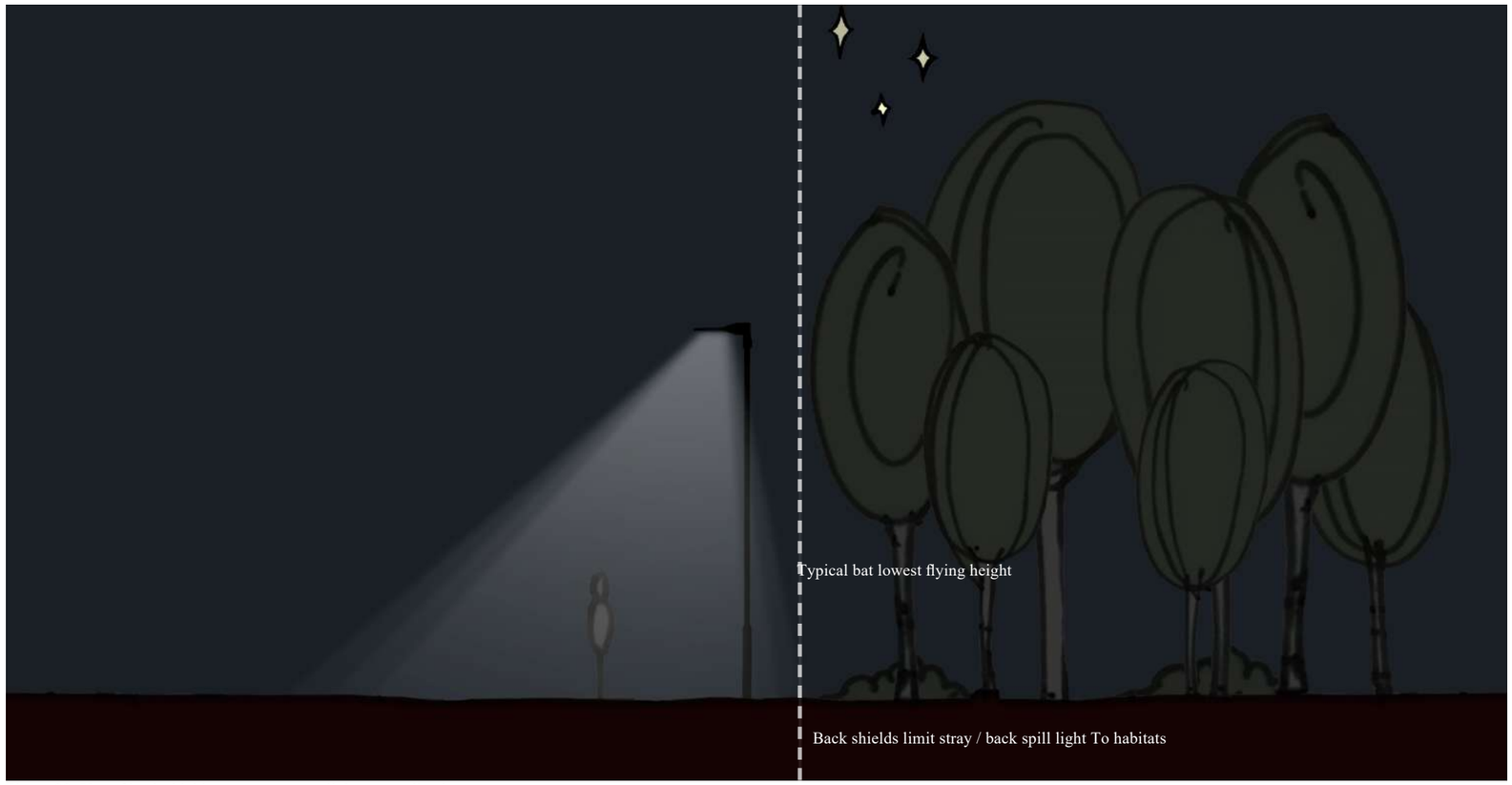


Figure 22: Use of back shields to prevent stray light to woodland areas

3.2 Light Colour

3.2.1 Colour temperature

The colour of light; be it warm light or a cool light is described as colour temperature and is measured in Kelvin (K). The lower the number, the warmer the light. The higher the number, the cooler the light. Please refer to Figure 23 as a guide.

The choice of colour temperature is a matter of aesthetics, ambience and function of the space. Typically, warmer colour temperatures are used in environments that promote relaxation, while intermediate and cooler colour temperatures are functional.

The use of 3,000K (warm white) is recommended for use across the CAVC, BWC site.

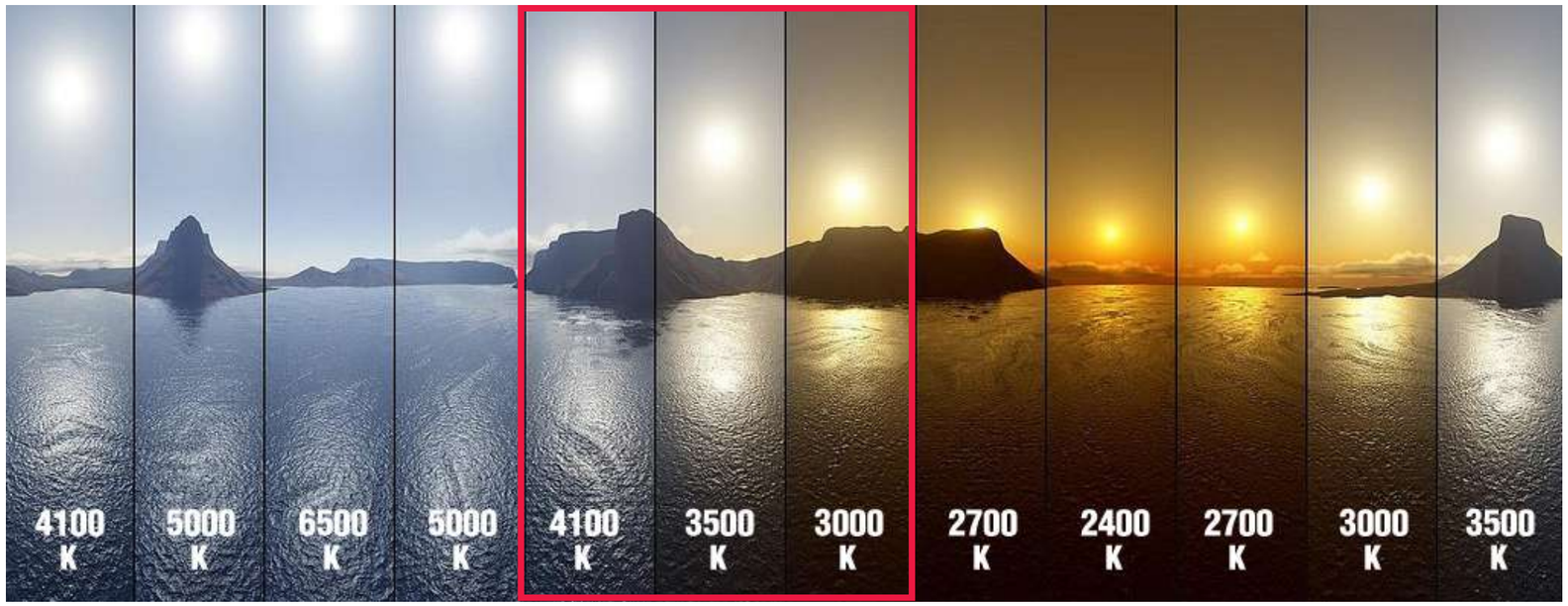


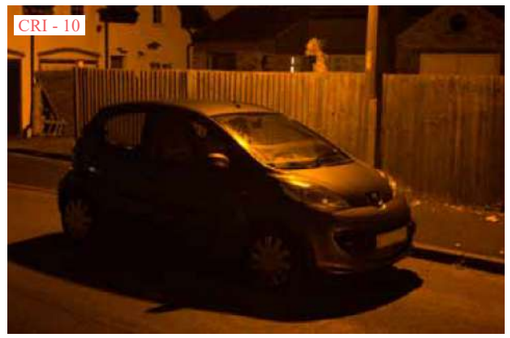
Figure 23: Colour temperature guide

3.2.2 Colour rendering

Not to be confused with colour temperature; colour rendering is how well the light makes the colour of an object appear to the human eye and how well subtle variations in colour shades are revealed.

The Colour Rendering Index (CRI) is a scale from 0 to 100 indicating how accurate a light source is at rendering colour when compared to a reference light source. Please refer to Figure 24. Good colour rendering enables users of a space to appreciate its context; textures, colours and materials.

The use of CRI ≥80 is recommended throughout the external areas/ public realm of the site.



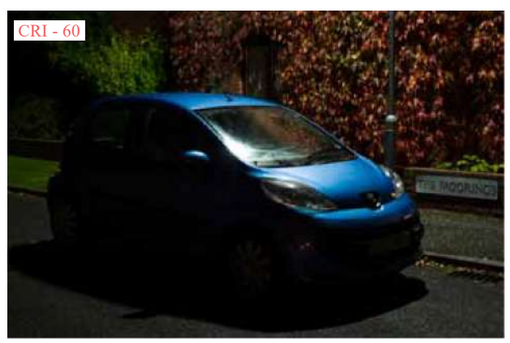


Figure 24: Colour rendering guide

4 Design Criteria

4.1 Environmental Zone

The BWC site is situated in a well inhabited urban setting. The site lies adjacent to a mix of commercial and residential properties. - Figure 25.

This document proposes that the existing area and context surrounding the site is classified as being with an E3 zone due to the suburban location and existing traffic flow.

An E3 zone is defined within the Institute of Lighting Professionals (ILP) GN01: Guidance Notes for the Reduction of Obtrusive Light (GN01) as medium district brightness, Table 1.

Establishing the environmental zone helps to set the limiting lighting criteria to mitigate light obtrusion. The characteristics of light obtrusion are:

- Light Intrusion: stray light beyond the task area onto neighbouring dwellings or sensitive receptors.
- Source Intensity: how bright the light source appears to an observer.
- Sky Glow: a combination of Direct Upward Light and Indirect Upward Light. This effect is often seen as a glow in the night sky. Sky glow can be quantified in terms of upward flux and upward light output ratio which is the percentage of the luminaire output emitted above the horizontal plane.

Light obtrusion characteristics are shown graphically in Figure 26.

Any future design shall consider the ILP lighting criteria associated with an E3 environmental zone and demonstrate compliance.

Figure 25: Site context

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

Table 1: Environmental Zones

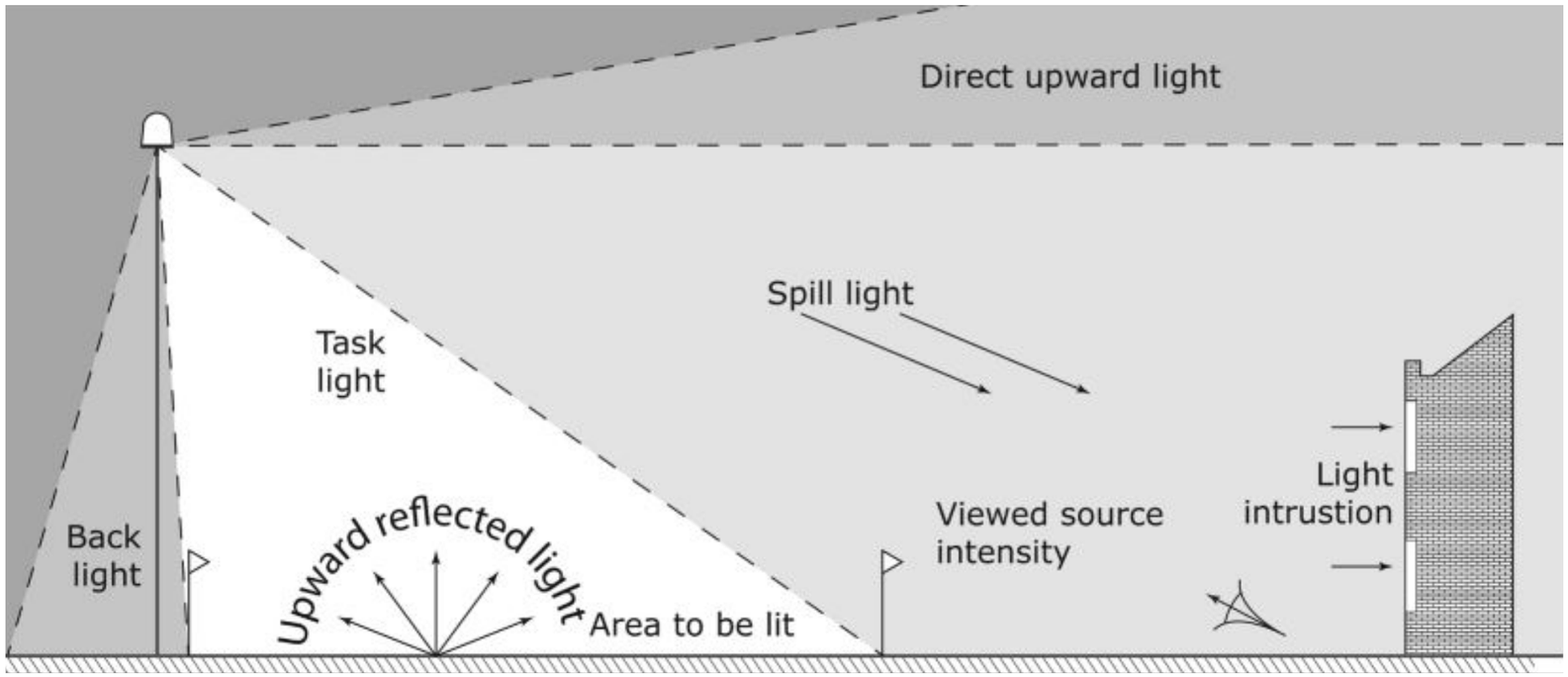


Figure 26: Light obtrusion characteristics - extract from ILP GN01

4.2 Mitigation Methods

To minimise nuisance and light intrusion, GN01 stipulates maximum values of vertical illuminance upon the façades of dwellings for each environmental zone. For an E3 zone, 10 lux is permitted during pre-curfew hours and 2 lux is the maximum value for post-curfew hours.

Lighting calculations have been carried out as proof of concept for the BWC external lighting design. A preliminary assessment of vertical illuminance levels upon the residential areas has also been conducted. The maximum vertical illuminance does not exceed 2 lux and therefore the design satisfies the recommendations for an E3 zone.

While adhering to the limiting vertical illuminance criteria the following mitigation methods shall be used to further minimise the impact of artificial light onto all sensitive receptors:

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

Figure 27: Maximum values of vertical illuminance on premises – extract from ILP GN01

Light source - Typically an LED source is considered to be more appropriate to reduce the impact to bats as it has less UV component and good colour rendition.

Lighting controls - Using a lighting control system ensures that lighting is only used in areas of the public realm when it is needed and limits light exposure to ecologically sensitive areas. Refer to section 7 "Lighting Control" for more details.

Glare control accessories - Lanterns shall have the ability to be fitted with back shields so that backward light spill can be minimised.

4.3 Lighting Treatment Plan

The following British Standards, codes and best practice guidelines have been considered for the development of the external illuminance level criteria at CAVC, BWC:

- BS EN 5489-1:2020 Lighting of Roads and Public Amenity Areas
- BS EN 13201-2: 2015 Road Lighting, Selection of Lighting Classes
- BS EN 13201-3:2015 Road Lighting, Performance Requirements
- CIBSE/SLL Lighting Guide 6 - Lighting of the Outdoor Environment
- CIBSE/SLL Lighting Guide 16 - Lighting for stairs
- BS 12464-2:2014 - Lighting of Work Places, Outdoor Work Places
- BS 8300-1:2018 Design of an accessible and inclusive built environment
- ILP GN01: Guidance Note 1 for the Reduction of Obtrusive Light
- ILP GN08: Bats and Artificial Lighting

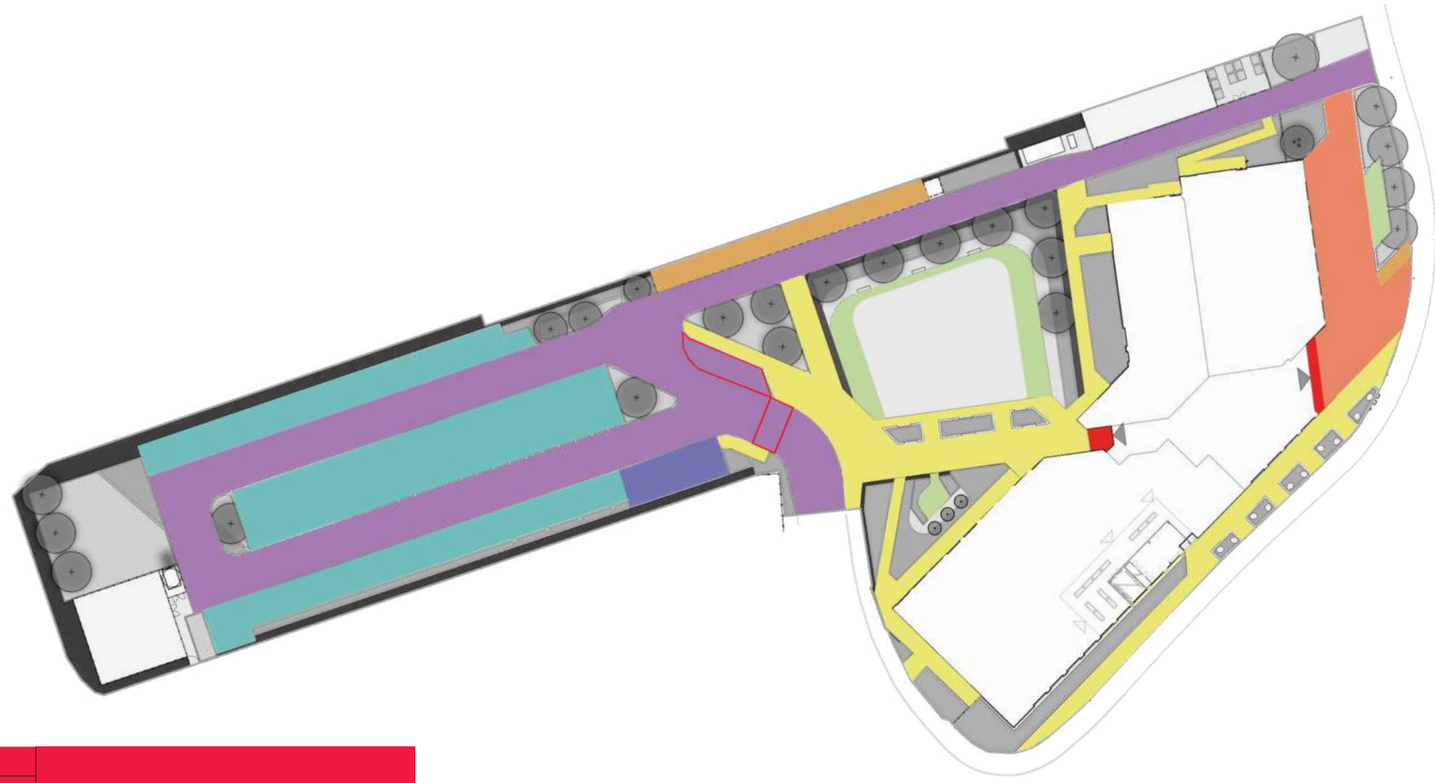


Figure 28: Lighting treatment plan

Type		Lighting classification	Maintained Horizontal Illuminance			Additional Requirements			Additional Notes
			Average in Lux (Ēa)	Minimum in Lux (Emin)	Uniformity (Uo)	Vertical in Lux (Ev, min)	Cylindrical in Lux (Esc, min)	Glare (R_{GL})	
	Car Park	-	10	-	0.25	-	-	<50	BS EN 5489: Medium traffic BS EN 12464
	Vehicular conflict areas	C4	10	-	0.4	-	-	<50	BS EN 13201-2
	Vehicular access	-	10	-	0.25	-	-	<50	BS EN 12464 - same level as car park
	Secondary route (Pedestrian & cyclists)	P4	5	1	-	-	-	<50	BS EN 13201-2 BS EN 12464
	Entrance approach	P2	10	2	-	3	2	<50	BS EN 13201-2
	Service/storage areas (criteria only required temporarily during times of use).	-	20	-	0.25	-	-	<55	BS EN 12464 : Table 5.7 *Exact area TBC
	Dwell areas (Pedestrians & cyclists)	P3	7.5	1.5	-	-	-	<50	BS EN 13201-2
	Main entrances to buildings	-	-	100	-	-	-	<50	BS 8300-1
	Accessible car park spaces	-	20	-	0.4	5	5	<50	BS EN 5489 & BS 8300-1
	Bicycle parking	-	100	-	0.25	-	-	-	BS EN 5489

Table 2: Illuminance level criteria per location

5 Proposed Lighting Layout

Proposed Lighting Layout

Luminaire Symbol	Luminaire Reference	Description	Image	Wattage
	EXA	Single head 6m column		16W
	EXB	Single head 6m column with backshield		
	EXC	Double head 6m column		
	EXD	Single head 6m column		33W
	EXK	Single head 6m column with backshield		
	EXE	Wall-mounted at 3m & 6m		9W
	EXEM	Wall-mounted at 3m with Emergency		9W
	EXF	Bollard		5W
	EXG	Recessed downlight		35W
	EXH	Symmetrical 4m column		25W
	EXJ	Surface mounted linear batten to bike shelter soffit		35W

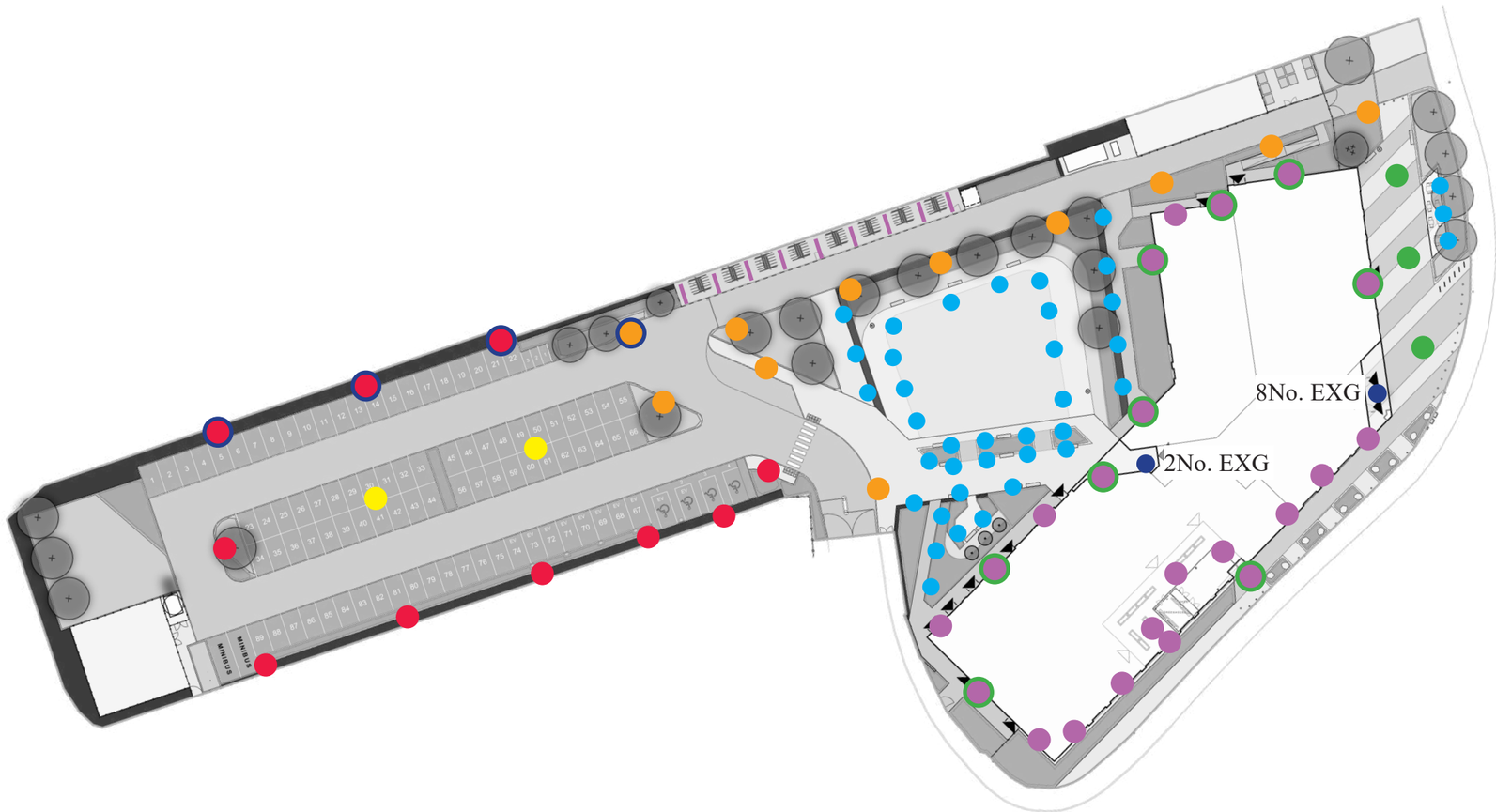


Figure 29: Indicative lighting layout

6 Lighting Schedule

Lighting Schedule

Luminaire Reference	Location	Image	Indicative Manufacturer	Model	Mounting Type	Optic/Beam Angle	Light Source	Dimming Protocol	Wattage (W)	Rated Luminous Flux (Lm)	Colour Temp (K)	Colour Rendering Index	Colour Deviation (SDCM)	IP / IK rating	Lifetime basis	Comments
EXA EXB EXC	• Across site		Whitecroft Lighting	Sirocco Midi	Pole Top	Narrow Optic	LED	DALI	16W	2199 lm	3000K	70	3	66 / 9	L90 at 100K hrs	1. Column/pole height 6m 2. Column/pole allows for a Ø46 to Ø76mm post top or side entry spigot 3. To be supplied with root or flange plate mounting accessories 4. Dimmable DALI driver required for identified areas
EXD EXK	• Car park spaces • Conflict areas		Whitecroft Lighting	Sirocco Midi	Pole Top	Area Optic 4571	LED	DALI	33W	4500 lm	3000K	70	3	66 / 9	L90 at 100K hrs	1. Column/pole height 6m 2. Column/pole allows for a Ø46 to Ø76mm post top or side entry spigot 3. To be supplied with root or flange plate mounting accessories
EXE	• Building perimeter		Whitecroft Lighting	Spectre WX	Surface	Forward throw downward distribution	LED	DALI	9W	1200 lm	3000K	80	4	65 / 7	L90 at 100K hrs	1. Mounted at 3 - 6m
EXF	• Dwell areas		Whitecroft Lighting	Kolo	Root	180 degree	LED	DALI	5.2W	410 lm	3000K	80	4	65 / 7	L90 at 100K hrs	1. To be supplied with root mounting accessories 2. Finish TBC by Architect
EXG	• Dwell area canopies		Whitecroft Lighting	Mirage 3 IP65	Recessed	Medium	LED	DALI	35W	3359lm	3000K	80	3	65 /10	L90 at 100K hrs	1. Provided with integral DALI dimming driver, contained within body.
EXH	• Main approach		Holophane	Signature	Pole Top	Symmetric	LED	DALI	25W	3200 lm	3000K	80	3	65	L70 at 100K hrs	1. Column height 4m
EXJ	• Bike shelters		Whitecroft Lighting	ACL Extreme	Surface	Diffuse	LED	DALI	35W	4000 lm	3000K	80	3	65	L80 at 54k hrs	

7 Lighting Control Strategy

Lighting Control

The Contractor shall provide, install, and commission a lighting control system to ensure lighting is only on during hours of darkness and ensure the level/amount of light meets the usage and requirements of the public realm at that time. Correct commissioning and utilisation of a lighting control system shall deliver the following:

- Energy saving
- Reduced carbon impact
- Reduce impact on residence and ecology (sensitive receptors)
- Reduction in obtrusive light
- Monitoring of luminaires for maintenance

As a minimum, the lighting control system shall provide the following functionality:

• Switch on the electric lighting at night via a photocell or time clock control.

• The control system is capable of night-time dimming to key lighting areas.

• Capability to schedule groups of columns/lanterns/luminaires to dim and turn on/off in response to the anticipated activities at night to further reduce obtrusive light.

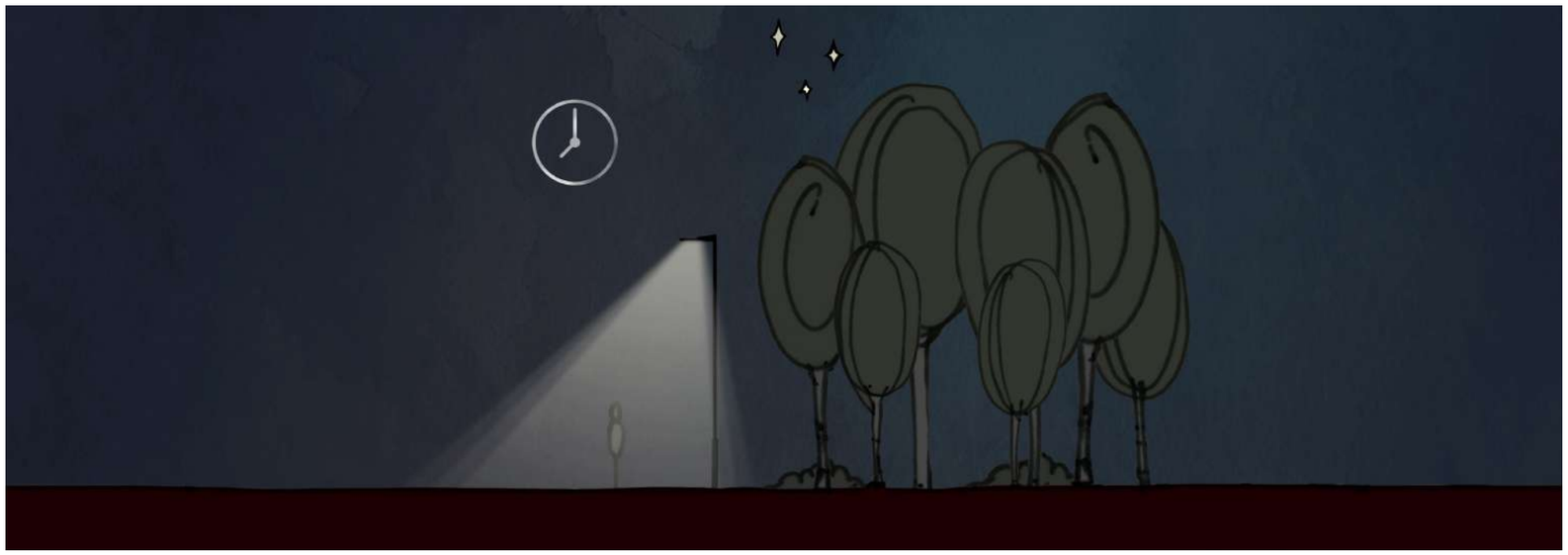


Figure 30: Lighting visualisation - pre-curfew

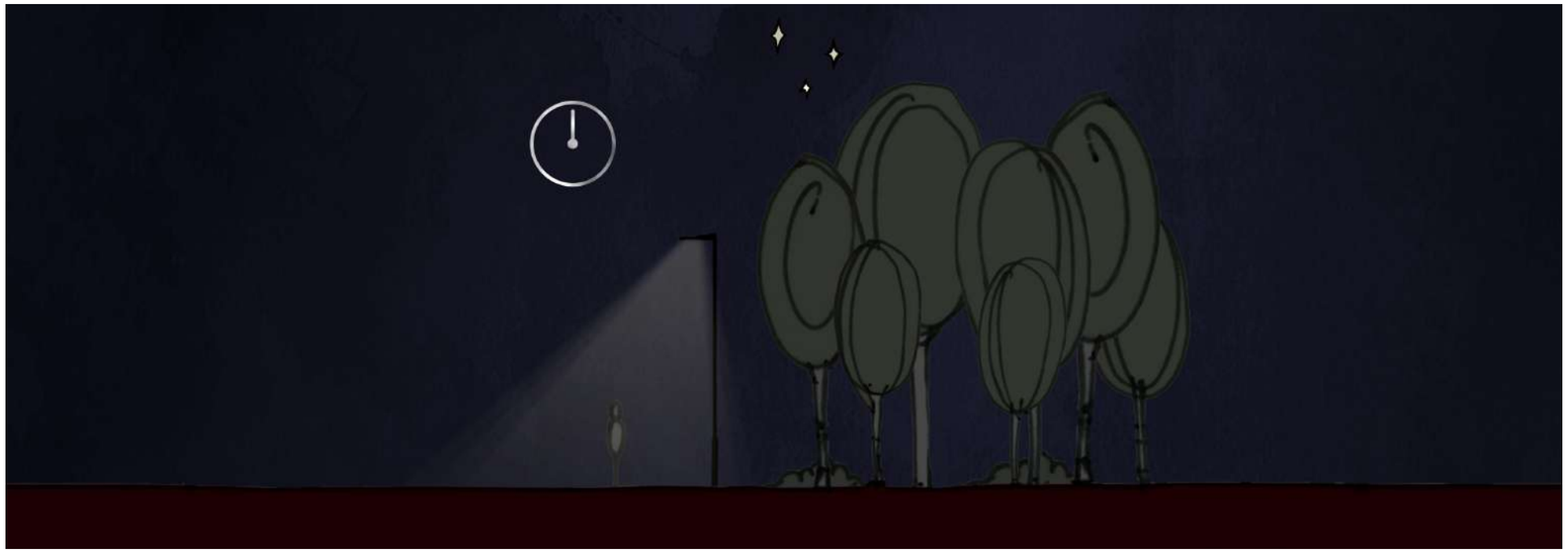


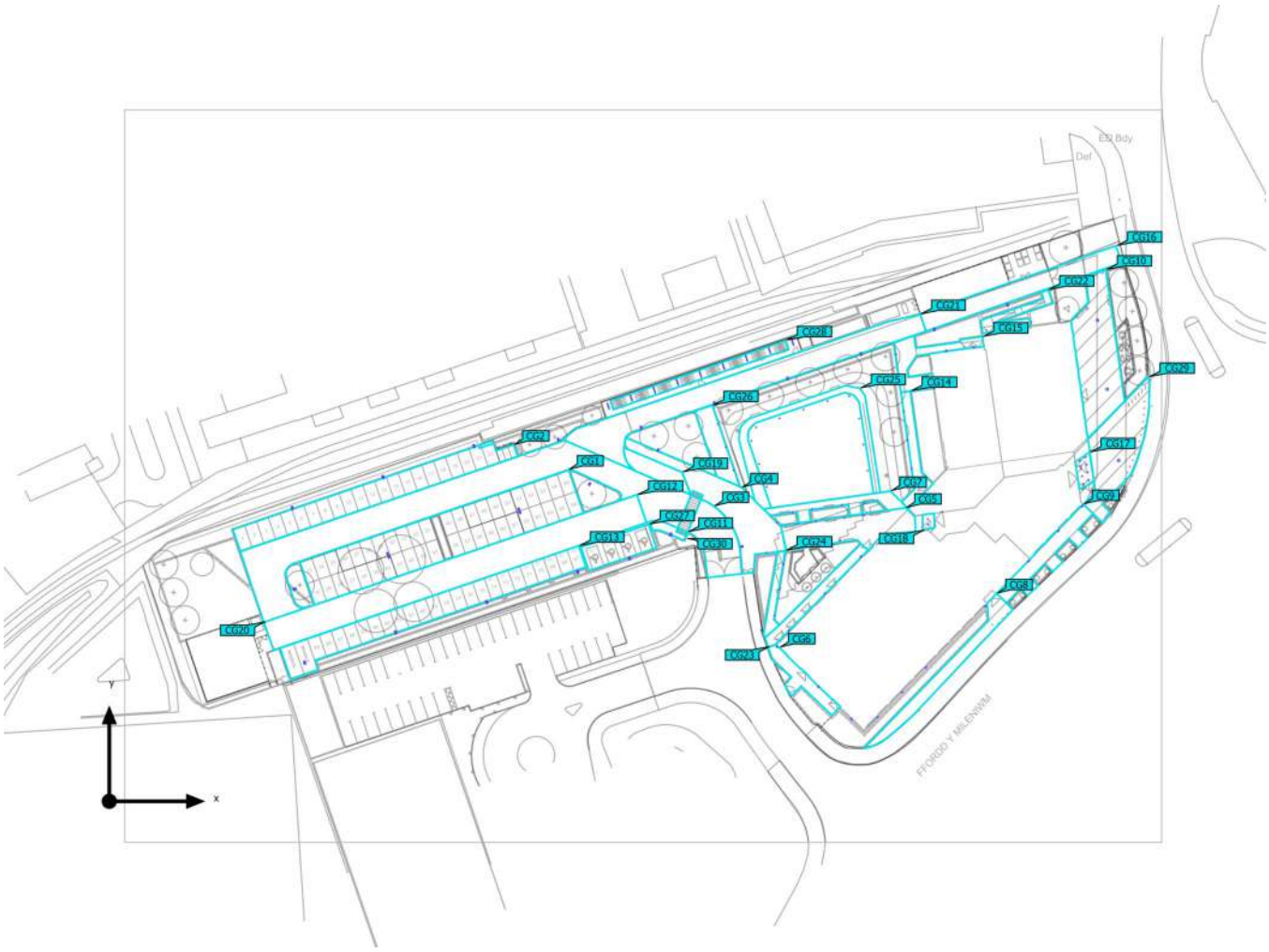
Figure 31: Lighting visualisation - post-curfew

Appendix A - Calculations

DIALux

(Light scene 1)

Calculation objects



(Light scene 1)

Calculation objects

Calculation surfaces

Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Car park Perpendicular illuminance Height: 0.000 m	12.8 lx	5.93 lx	19.3 lx	0.46	0.31	CG1
Car park Perpendicular illuminance Height: 0.000 m	11.9 lx	3.54 lx	20.2 lx	0.30	0.18	CG2
Vehicular access Perpendicular illuminance Height: 0.000 m	10.5 lx	2.99 lx	17.6 lx	0.28	0.17	CG3
Secondary route Perpendicular illuminance Height: 0.000 m	7.53 lx	2.41 lx	15.0 lx	0.32	0.16	CG4
Secondary route Perpendicular illuminance Height: 0.000 m	9.69 lx	2.24 lx	74.9 lx	0.23	0.030	CG5
Secondary route Perpendicular illuminance Height: 0.000 m	5.18 lx	2.82 lx	9.51 lx	0.54	0.30	CG6
Secondary route Perpendicular illuminance Height: 0.000 m	10.3 lx	1.60 lx	99.3 lx	0.16	0.016	CG7
Secondary route Perpendicular illuminance Height: 0.000 m	4.88 lx	1.31 lx	7.44 lx	0.27	0.18	CG8
Secondary route Perpendicular illuminance Height: 0.000 m	6.41 lx	2.40 lx	23.8 lx	0.37	0.10	CG9
Entrance approach Perpendicular illuminance Height: 0.000 m	13.9 lx	5.88 lx	43.6 lx	0.42	0.13	CG10
Secondary route Perpendicular illuminance Height: 0.000 m	18.0 lx	14.1 lx	19.9 lx	0.78	0.71	CG11

(Light scene 1)

Calculation objects

Vehicular access Perpendicular illuminance Height: 0.000 m	11.8 lx	9.32 lx	16.5 lx	0.79	0.56	CG12
Car park Perpendicular illuminance Height: 0.000 m	13.1 lx	7.03 lx	22.7 lx	0.54	0.31	CG13
Secondary route Perpendicular illuminance Height: 0.000 m	9.85 lx	1.57 lx	88.1 lx	0.16	0.018	CG14
Secondary route Perpendicular illuminance Height: 0.000 m	14.1 lx	2.04 lx	86.6 lx	0.14	0.024	CG15
Vehicular access Perpendicular illuminance Height: 0.000 m	11.9 lx	5.15 lx	16.0 lx	0.43	0.32	CG16
Main entrance Perpendicular illuminance Height: 0.000 m	148 lx	116 lx	163 lx	0.78	0.71	CG17
Main entrance Perpendicular illuminance Height: 0.000 m	212 lx	125 lx	279 lx	0.59	0.45	CG18
Vehicular access Perpendicular illuminance Height: 0.000 m	11.1 lx	8.78 lx	14.1 lx	0.79	0.62	CG19
Vehicular access Perpendicular illuminance Height: 0.000 m	12.1 lx	7.67 lx	20.7 lx	0.63	0.37	CG20
Vehicular access Perpendicular illuminance Height: 0.000 m	12.0 lx	8.20 lx	15.7 lx	0.68	0.52	CG21
Secondary route Perpendicular illuminance Height: 0.000 m	11.5 lx	3.66 lx	29.0 lx	0.32	0.13	CG22
Secondary route Perpendicular illuminance Height: 0.000 m	6.27 lx	3.85 lx	9.07 lx	0.61	0.42	CG23

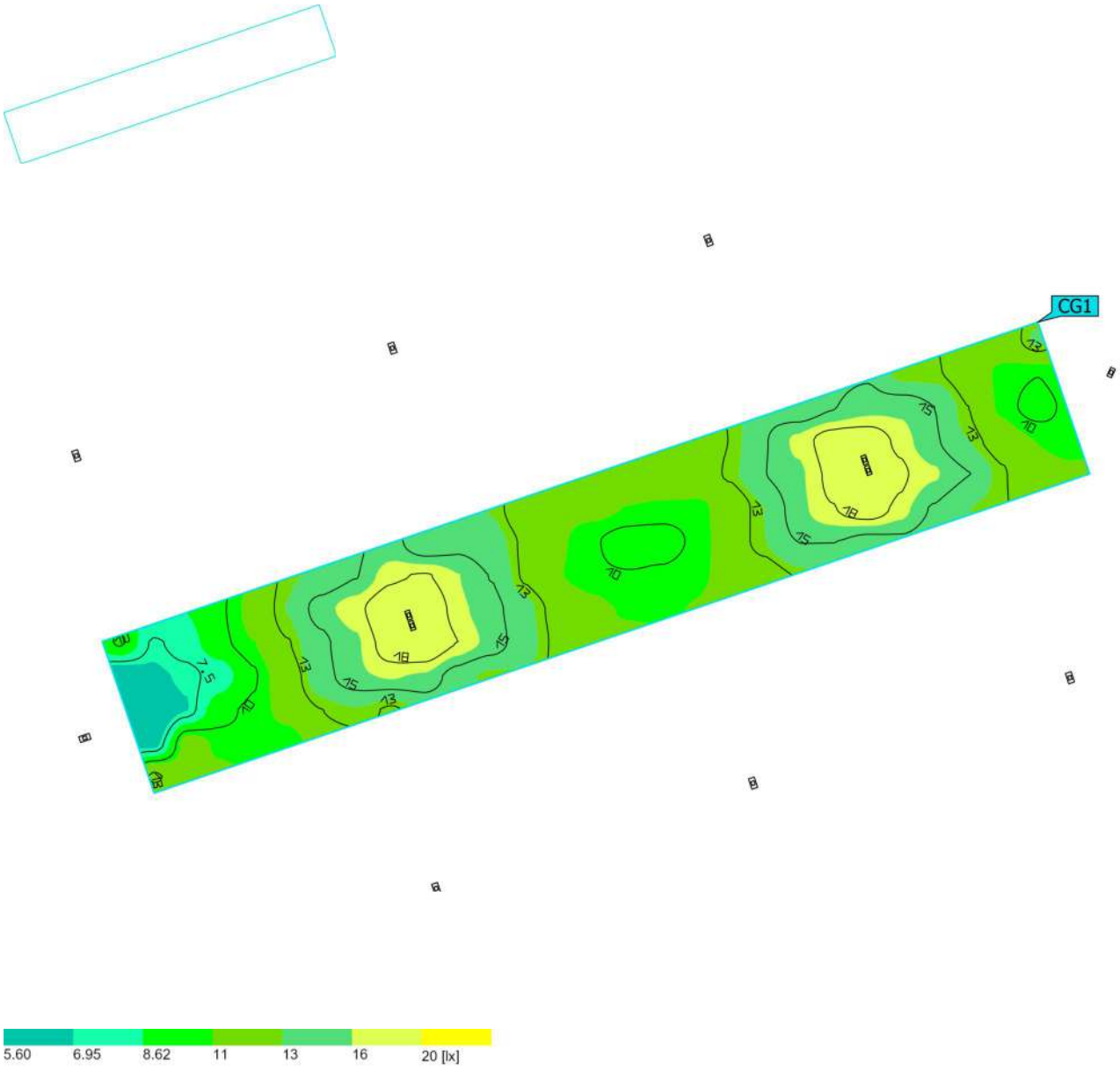
(Light scene 1)

Calculation objects

Secondary route Perpendicular illuminance Height: 0.000 m	14.3 lx	2.94 lx	87.9 lx	0.21	0.033	CG24
Dwell area Perpendicular illuminance Height: 0.000 m	8.31 lx	1.52 lx	34.6 lx	0.18	0.044	CG25
Secondary route Perpendicular illuminance Height: 0.000 m	10.6 lx	2.59 lx	53.2 lx	0.24	0.049	CG26
Accessible parking Perpendicular illuminance Height: 0.000 m	19.5 lx	14.4 lx	26.5 lx	0.74	0.54	CG27
Bicycle park Perpendicular illuminance Height: 0.800 m	122 lx	66.2 lx	210 lx	0.54	0.32	CG28
Entrance approach Perpendicular illuminance Height: 0.000 m	38.6 lx	3.95 lx	152 lx	0.10	0.026	CG29
Conflict Perpendicular illuminance Height: 0.000 m	10.9 lx	8.21 lx	18.5 lx	0.75	0.44	CG30

(Light scene 1)

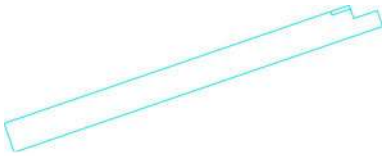
Car park

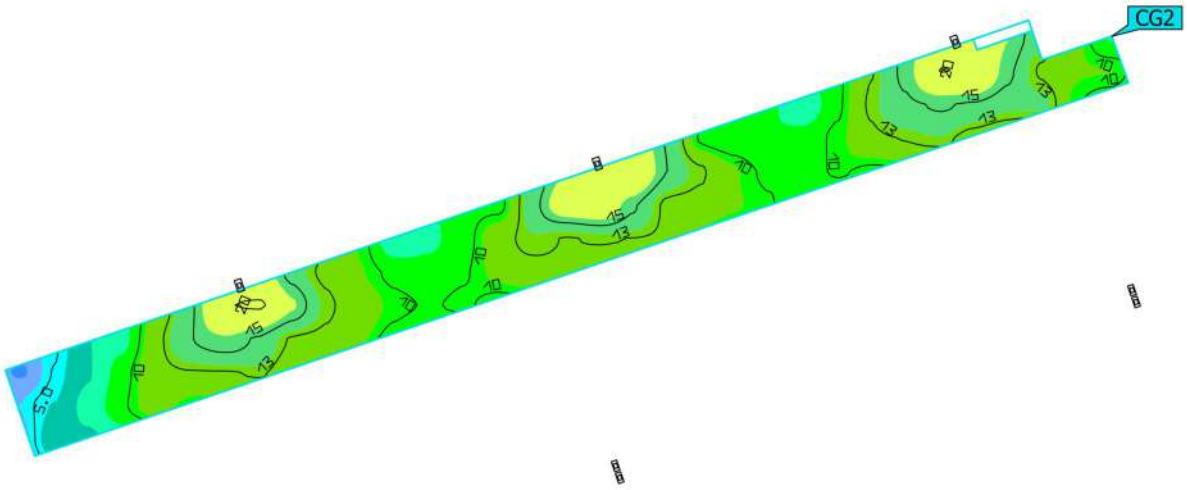


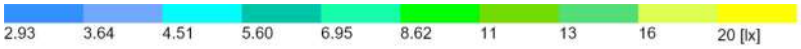
Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Car park Perpendicular illuminance Height: 0.000 m	12.8 lx	5.93 lx	19.3 lx	0.46	0.31	CG1

(Light scene 1)

Car park



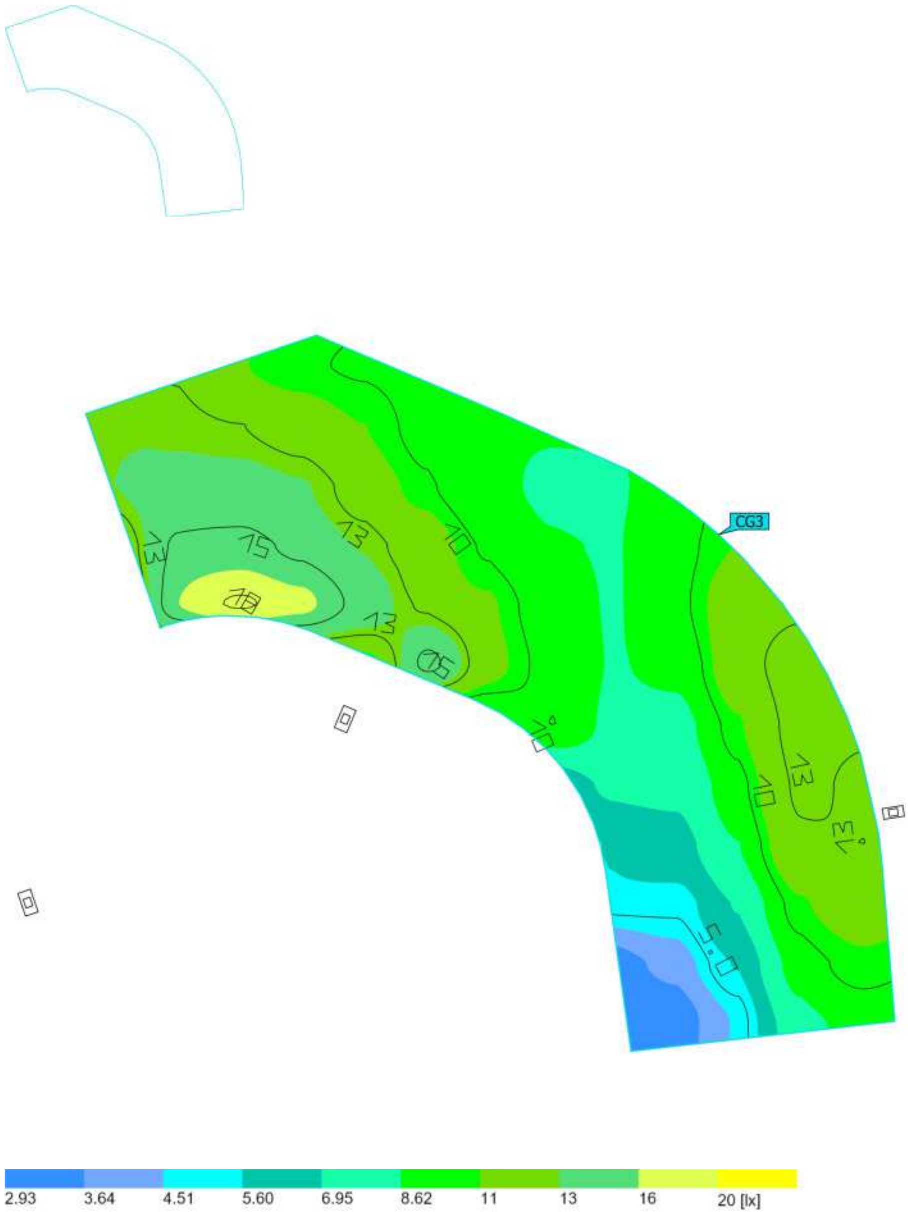




Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Car park Perpendicular illuminance Height: 0.000 m	11.9 lx	3.54 lx	20.2 lx	0.30	0.18	CG2

(Light scene 1)

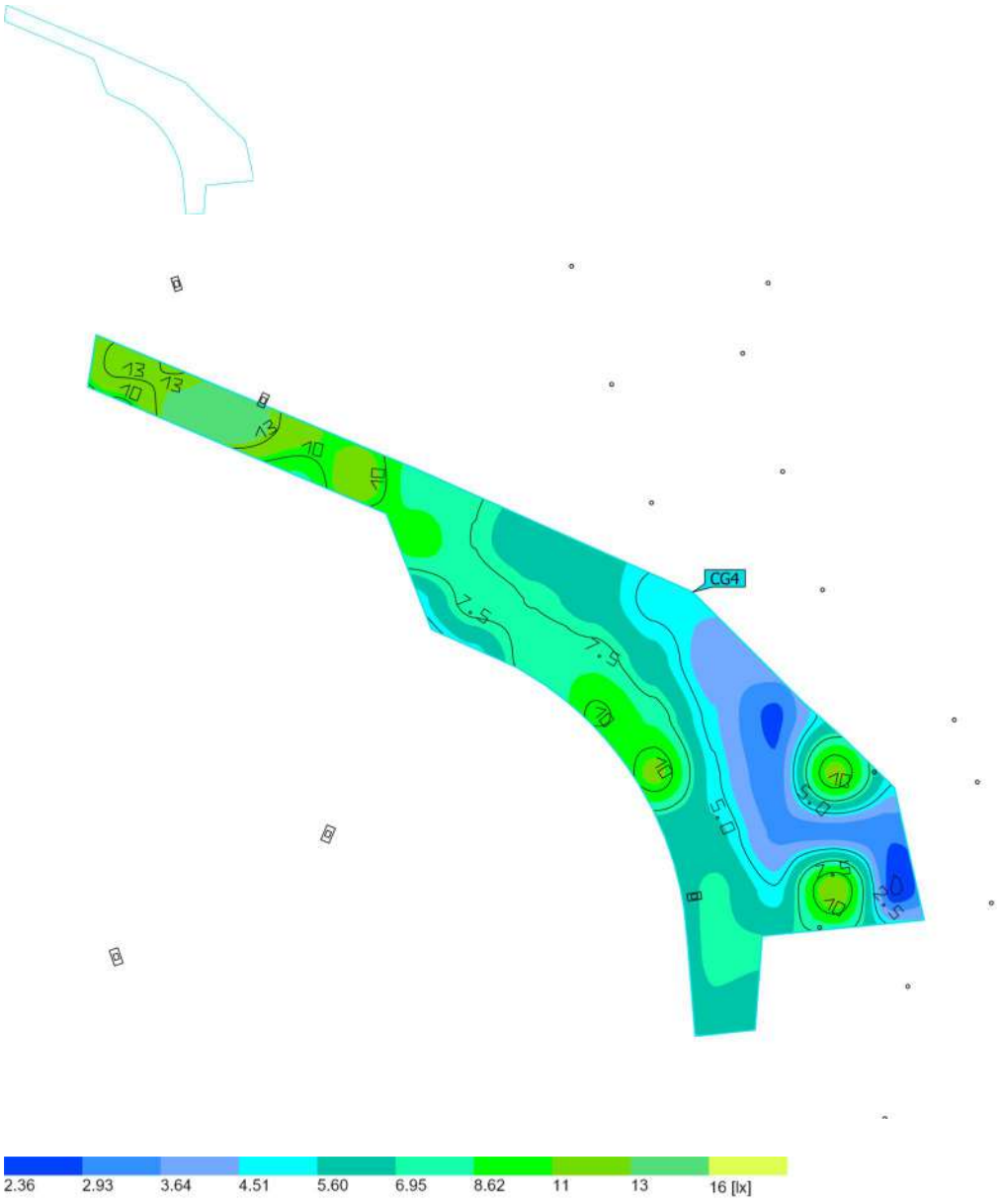
Vehicular access



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Vehicular access Perpendicular illuminance Height: 0.000 m	10.5 lx	2.99 lx	17.6 lx	0.28	0.17	CG3

(Light scene 1)

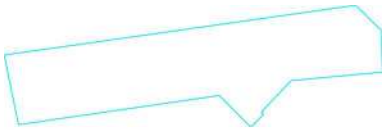
Secondary route

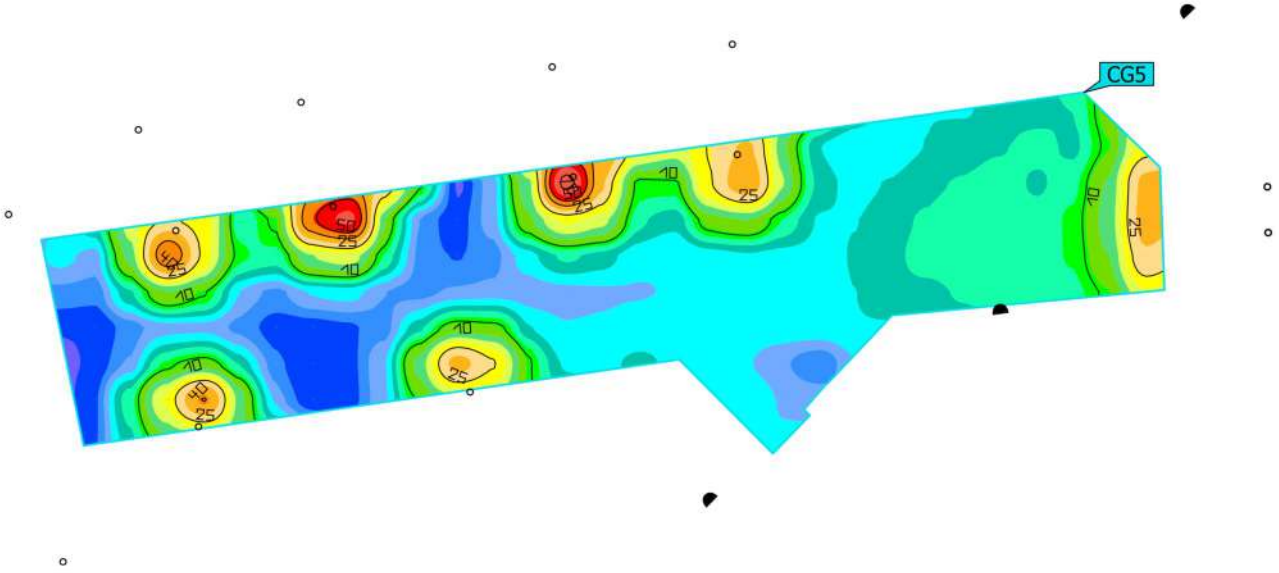


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	7.53 lx	2.41 lx	15.0 lx	0.32	0.16	CG4

(Light scene 1)

Secondary route

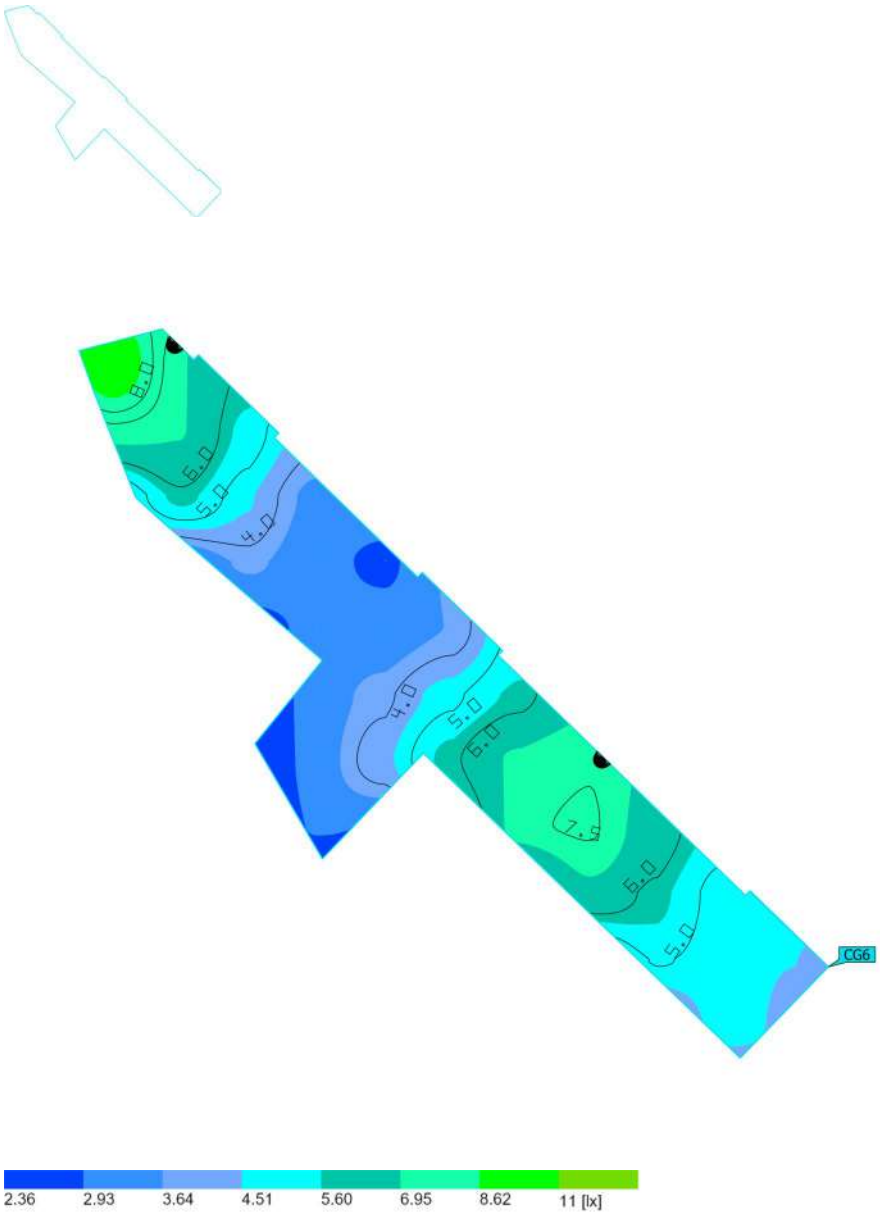




Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	9.69 lx	2.24 lx	74.9 lx	0.23	0.030	CG5

(Light scene 1)

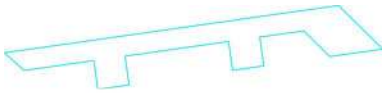
Secondary route

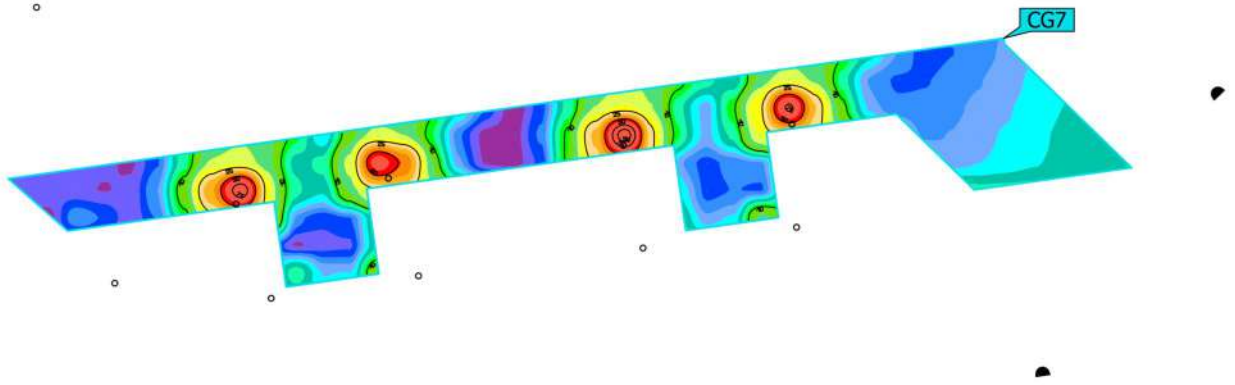


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	5.18 lx	2.82 lx	9.51 lx	0.54	0.30	CG6

(Light scene 1)

Secondary route

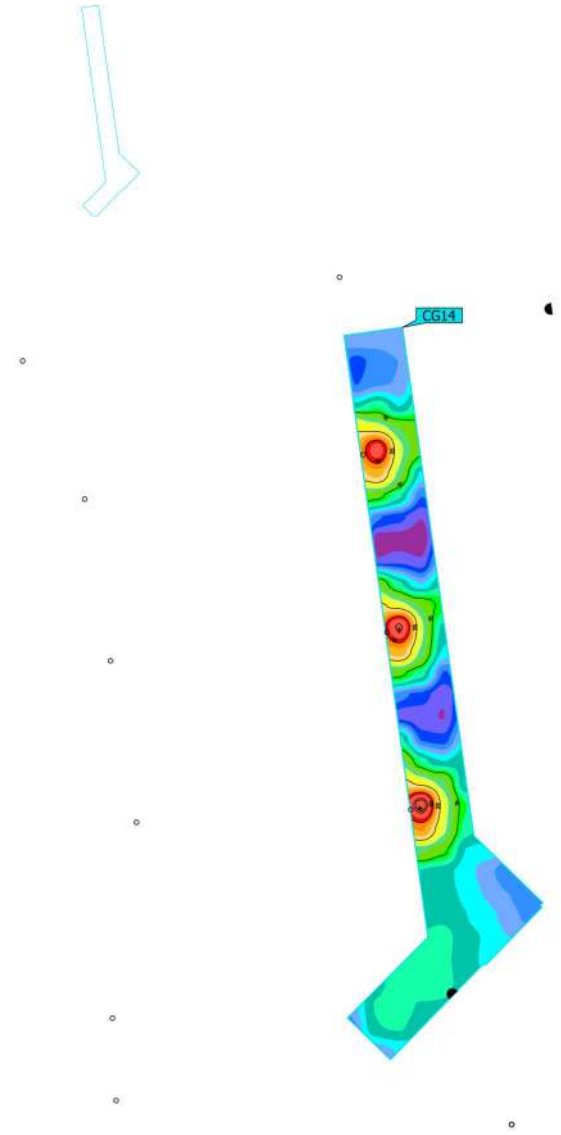


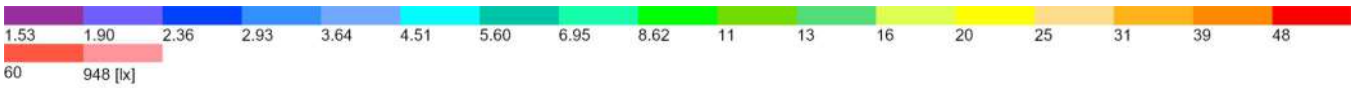


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	10.3 lx	1.60 lx	99.3 lx	0.16	0.016	CG7

(Light scene 1)

Secondary route

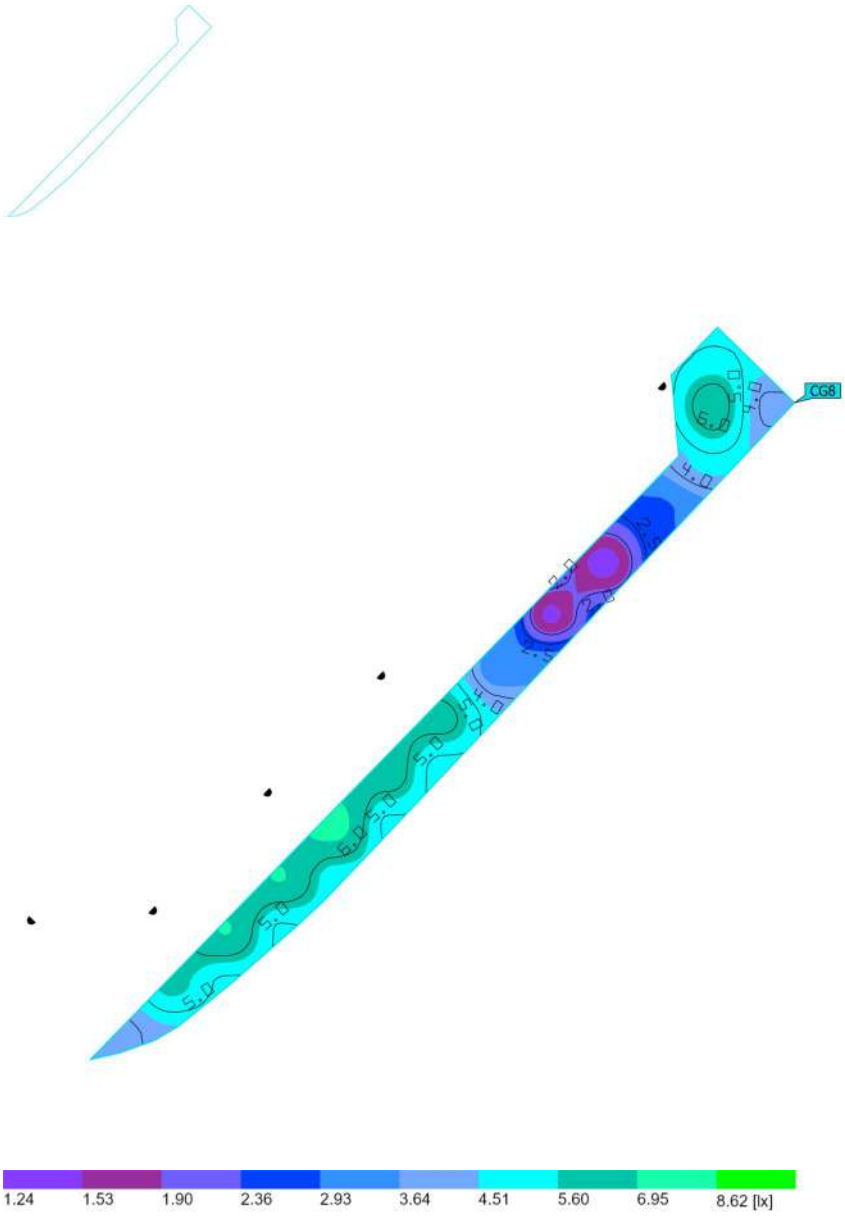




Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	9.85 lx	1.57 lx	88.1 lx	0.16	0.018	CG14

(Light scene 1)

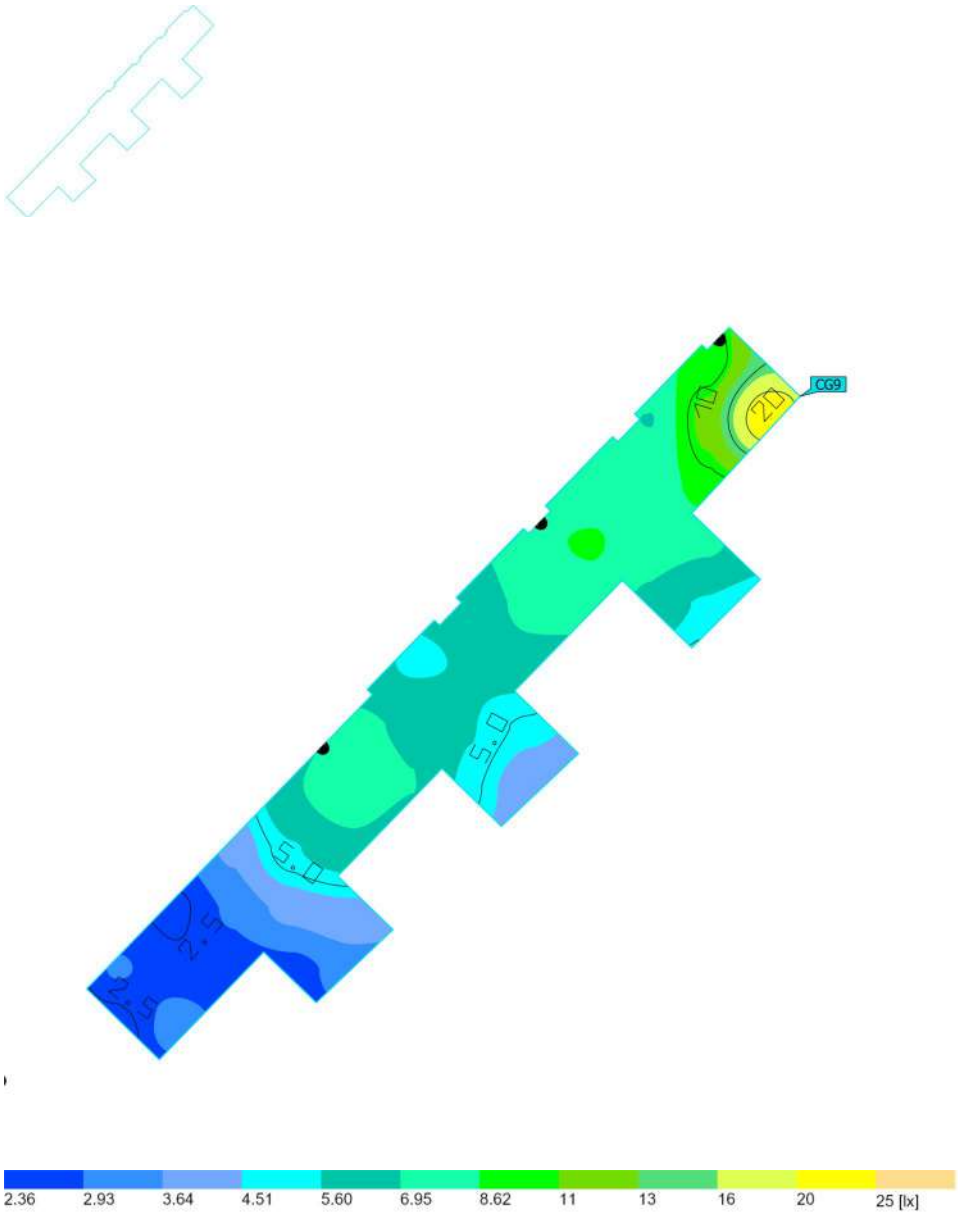
Secondary route



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	4.88 lx	1.31 lx	7.44 lx	0.27	0.18	CG8

(Light scene 1)

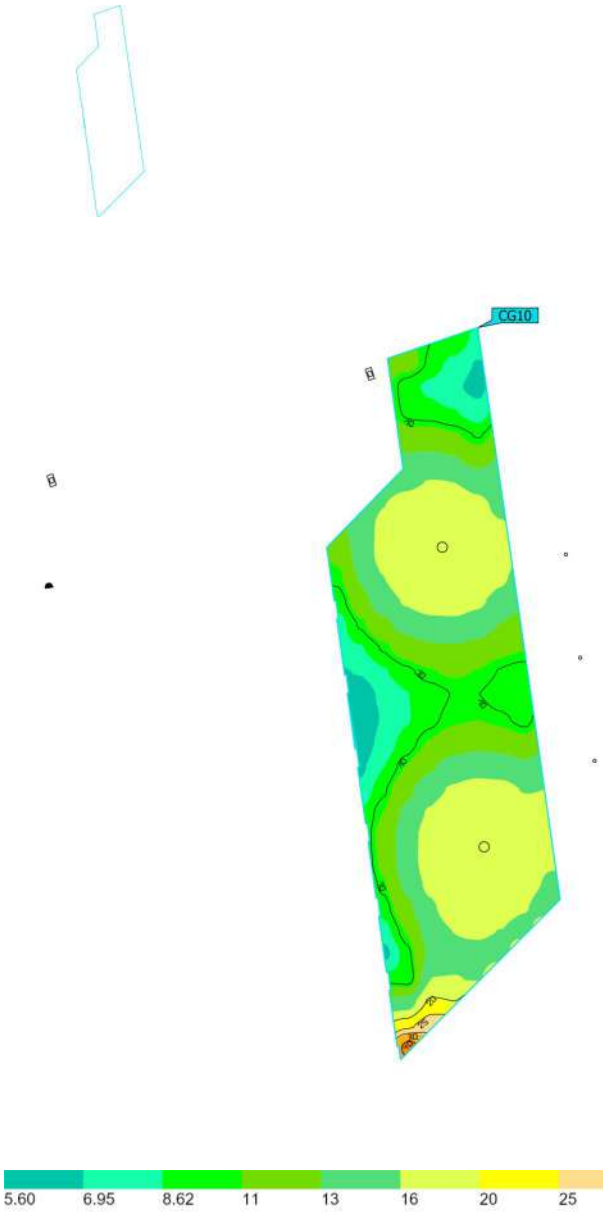
Secondary route



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	6.41 lx	2.40 lx	23.8 lx	0.37	0.10	CG9

(Light scene 1)

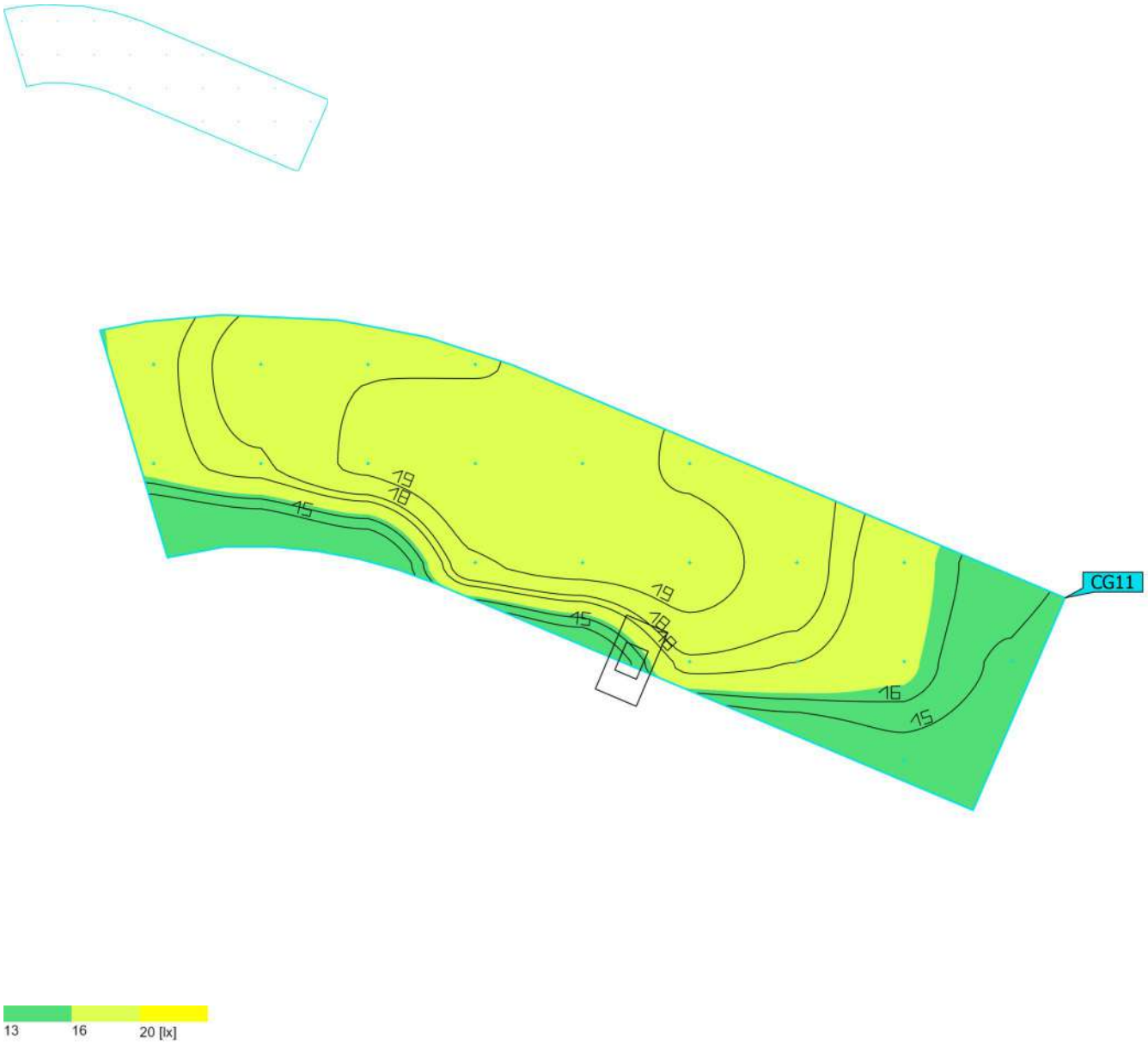
Entrance approach



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Entrance approach Perpendicular illuminance Height: 0.000 m	13.9 lx	5.88 lx	43.6 lx	0.42	0.13	CG10

(Light scene 1)

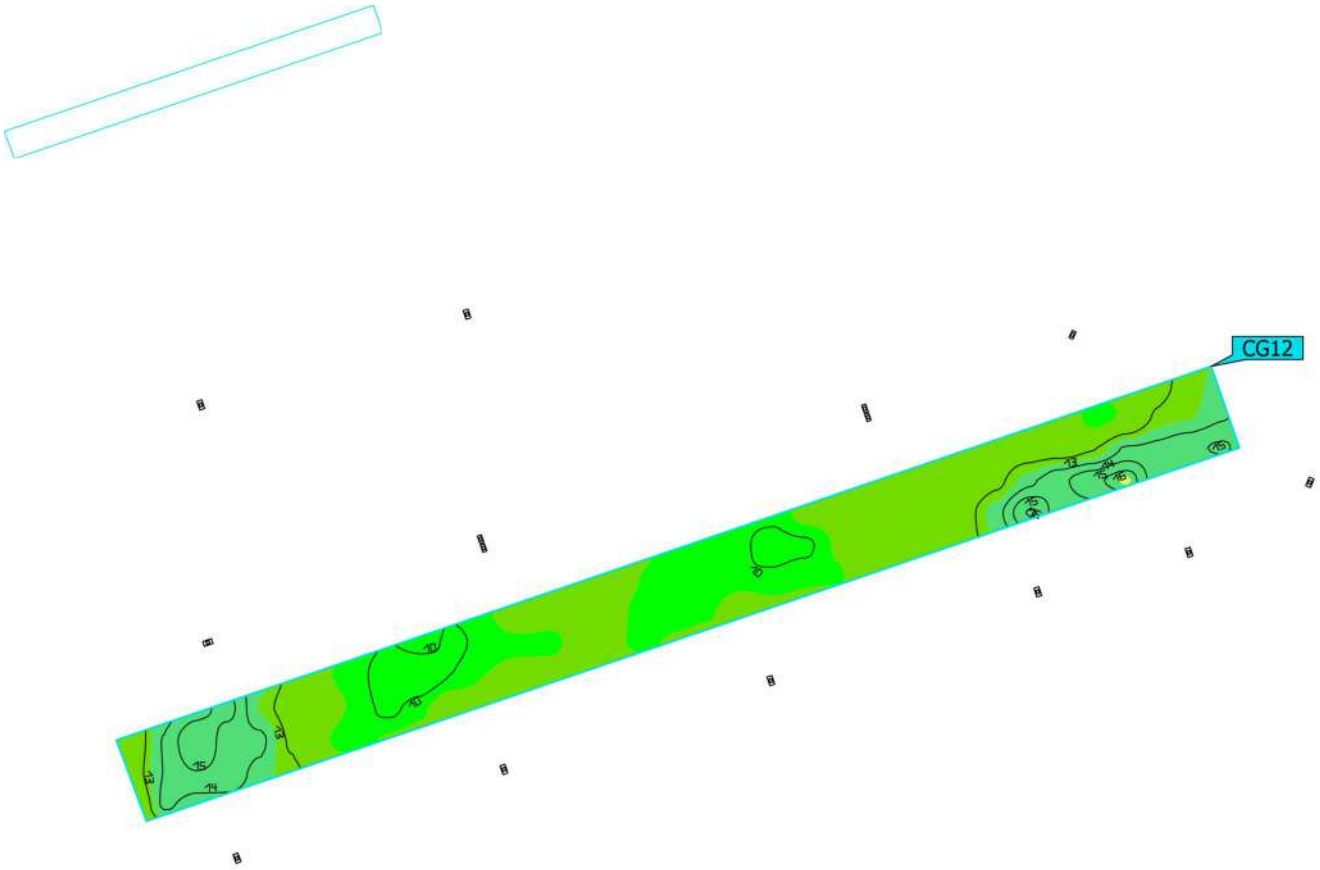
Secondary route



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	18.0 lx	14.1 lx	19.9 lx	0.78	0.71	CG11

(Light scene 1)

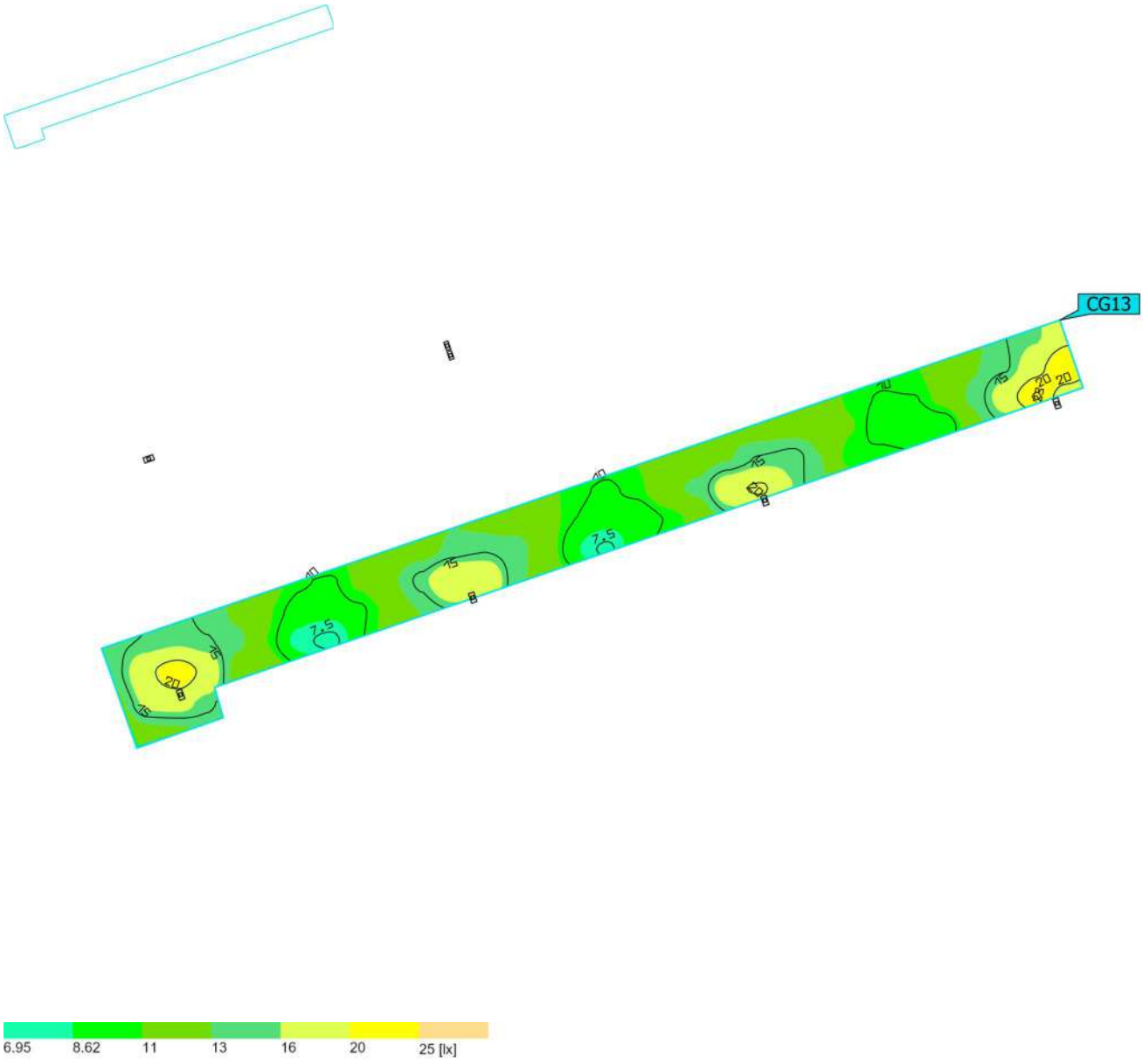
Vehicular access



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Vehicular access Perpendicular illuminance Height: 0.000 m	11.8 lx	9.32 lx	16.5 lx	0.79	0.56	CG12

(Light scene 1)

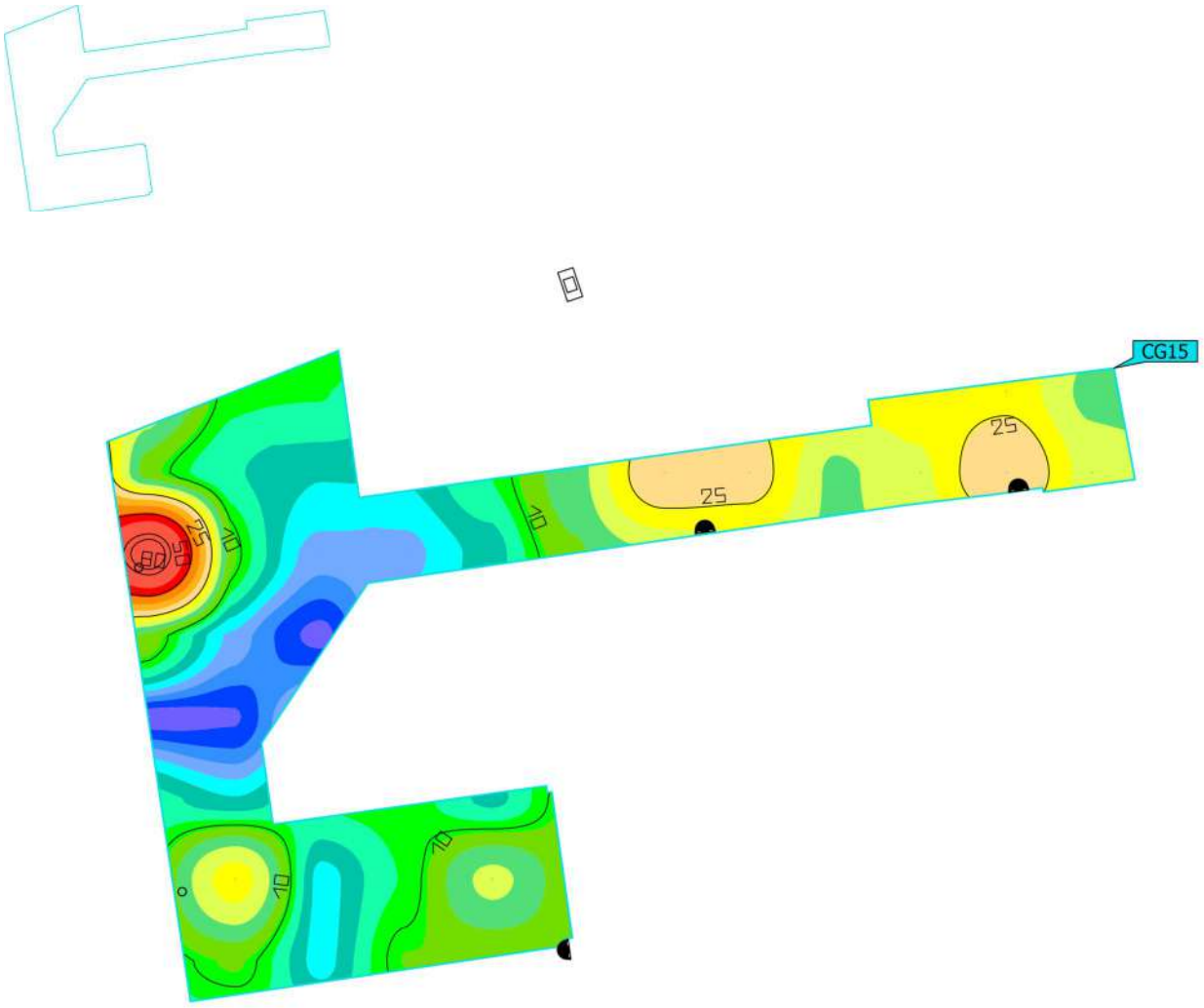
Car park

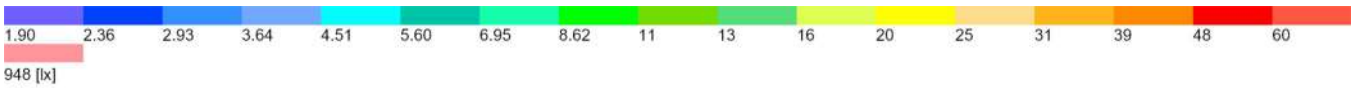


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Car park Perpendicular illuminance Height: 0.000 m	13.1 lx	7.03 lx	22.7 lx	0.54	0.31	CG13

(Light scene 1)

Secondary route

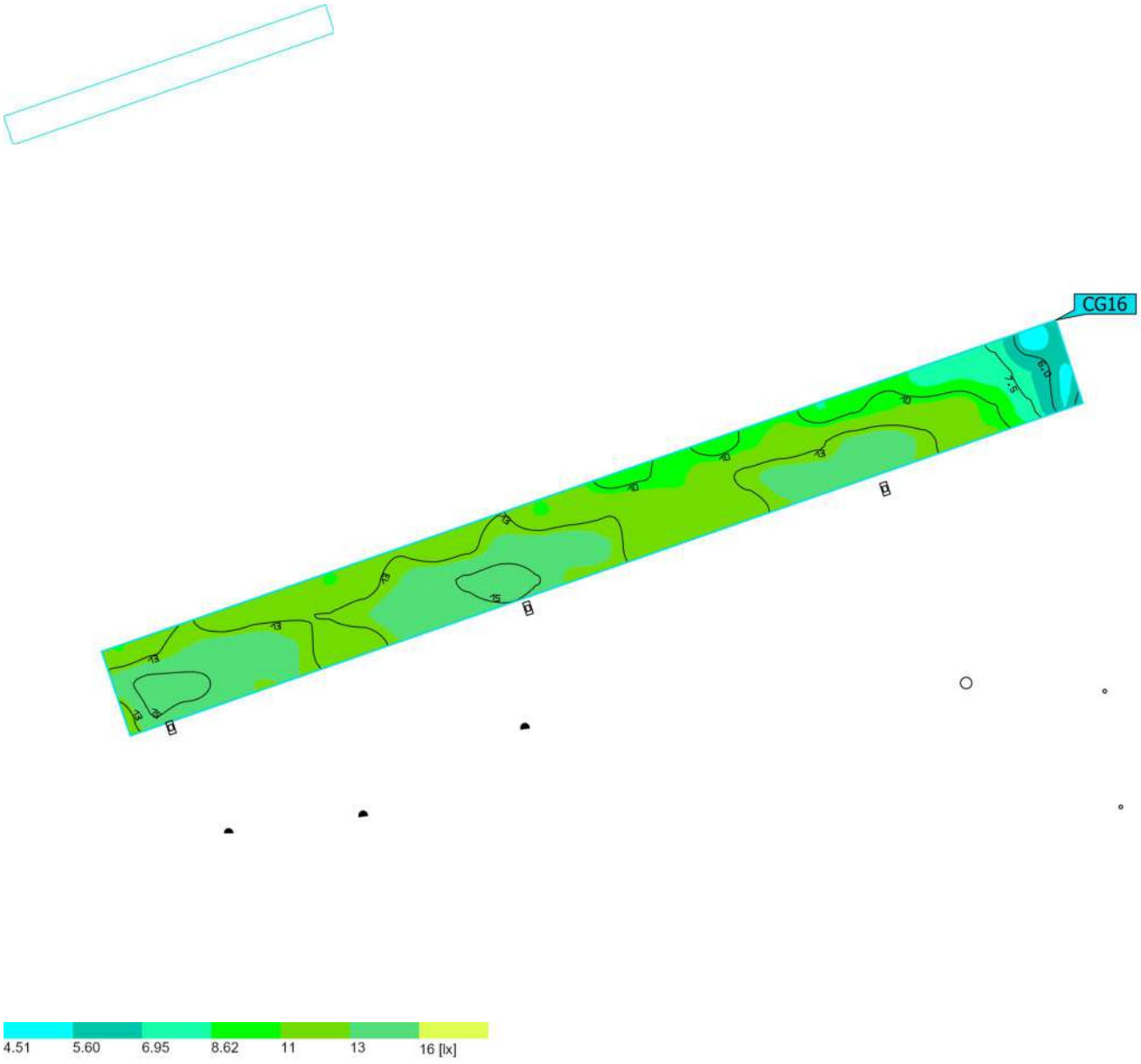




Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	14.1 lx	2.04 lx	86.6 lx	0.14	0.024	CG15

(Light scene 1)

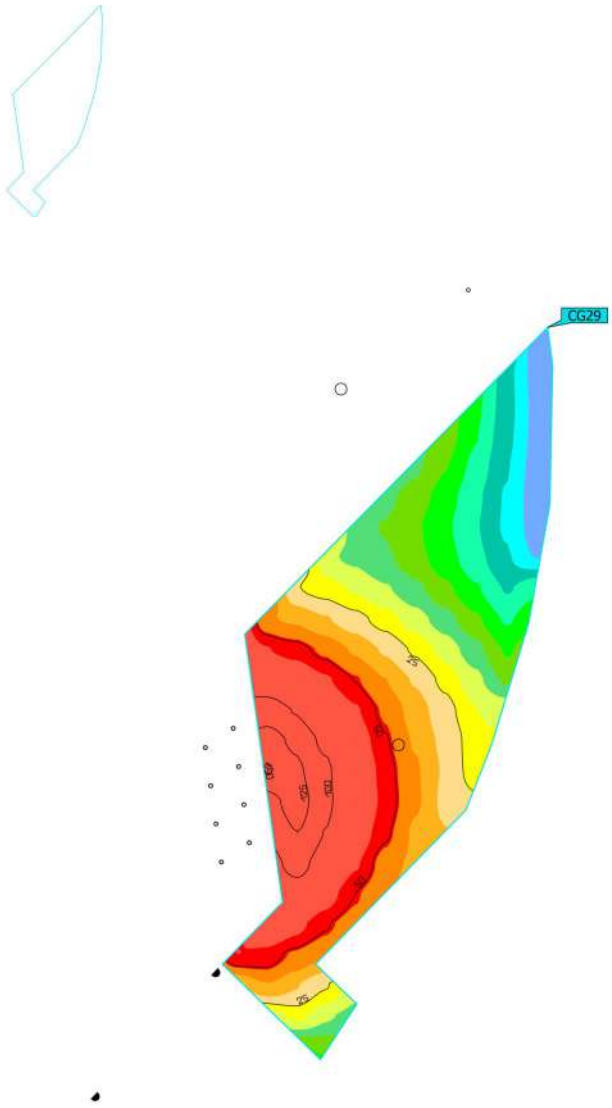
Vehicular access



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Vehicular access Perpendicular illuminance Height: 0.000 m	11.9 lx	5.15 lx	16.0 lx	0.43	0.32	CG16

(Light scene 1)

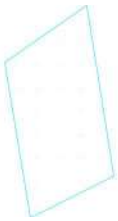
Entrance approach

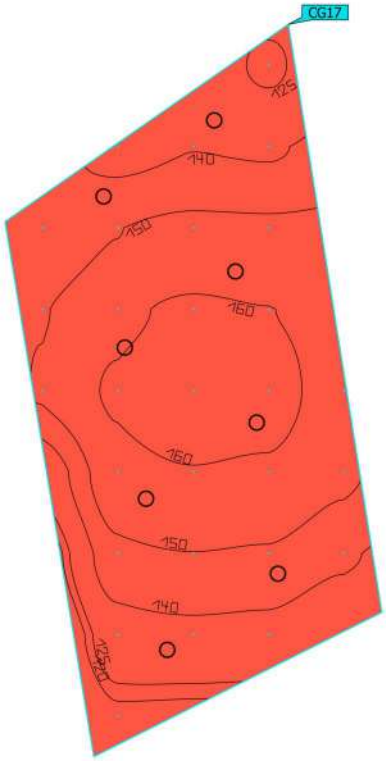


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Entrance approach Perpendicular illuminance Height: 0.000 m	38.6 lx	3.95 lx	152 lx	0.10	0.026	CG29

(Light scene 1)

Main entrance

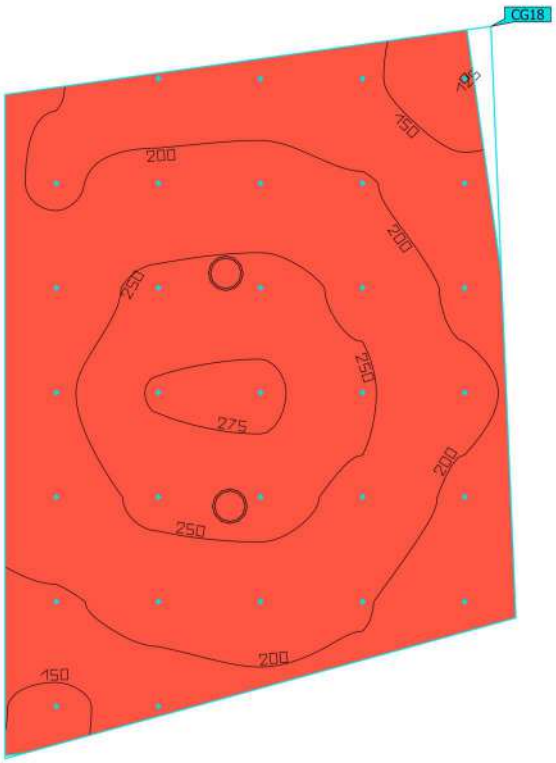




Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Main entrance Perpendicular illuminance Height: 0.000 m	148 lx	116 lx	163 lx	0.78	0.71	CG17

(Light scene 1)

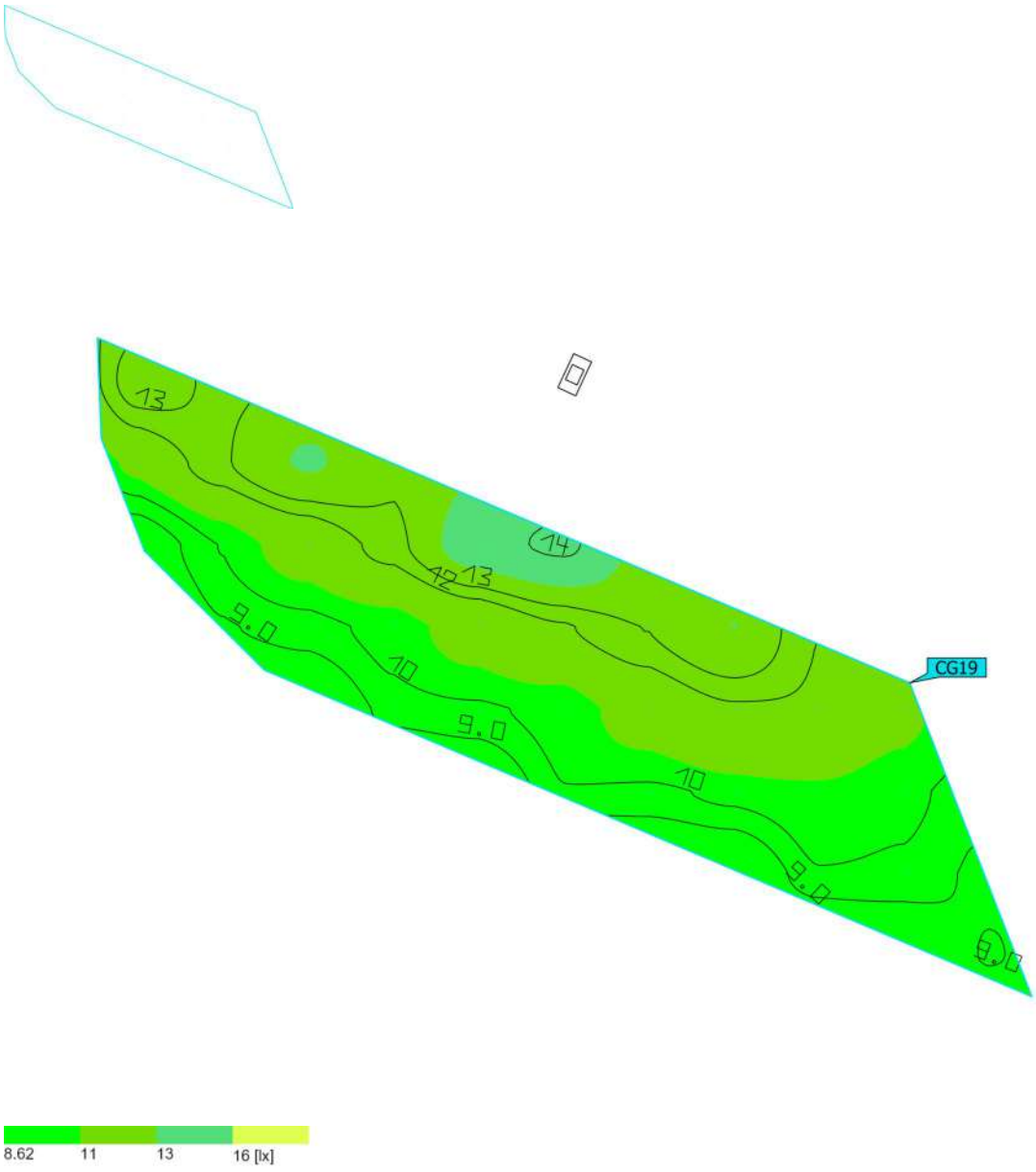
Main entrance



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Main entrance Perpendicular illuminance Height: 0.000 m	212 lx	125 lx	279 lx	0.59	0.45	CG18

(Light scene 1)

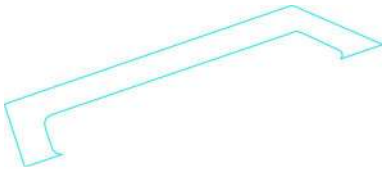
Vehicular access

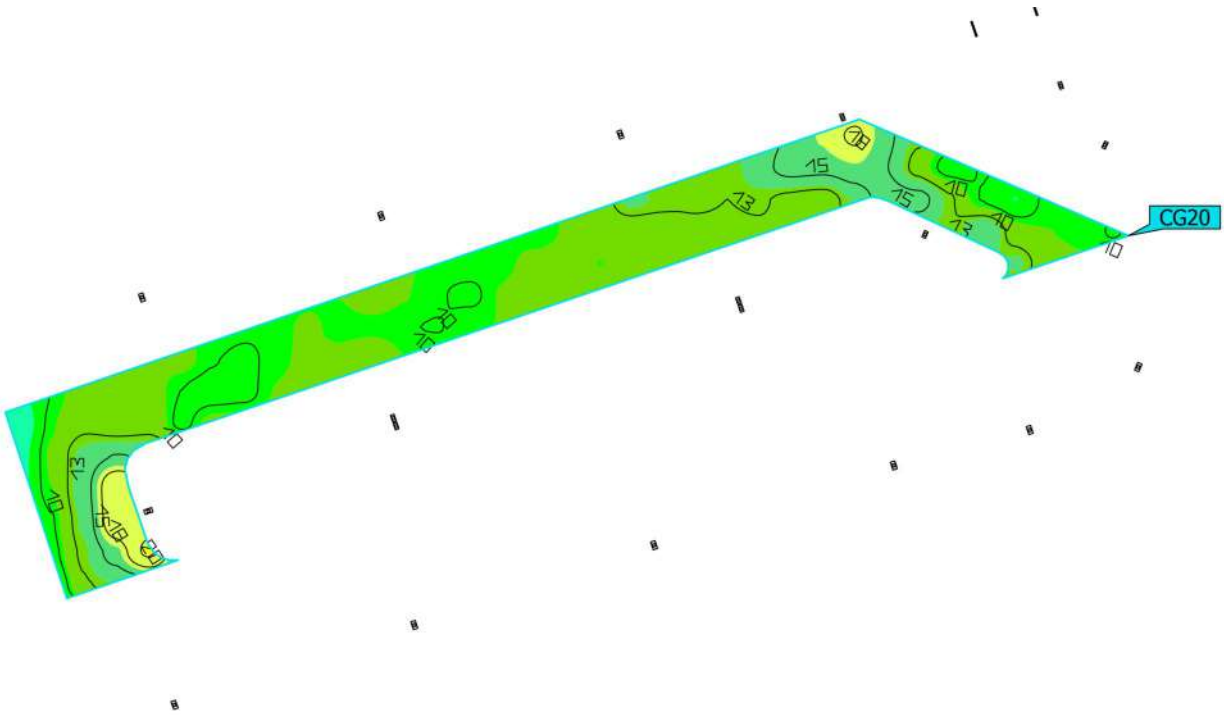


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Vehicular access Perpendicular illuminance Height: 0.000 m	11.1 lx	8.78 lx	14.1 lx	0.79	0.62	CG19

(Light scene 1)

Vehicular access

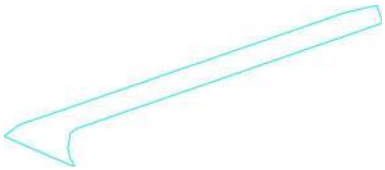


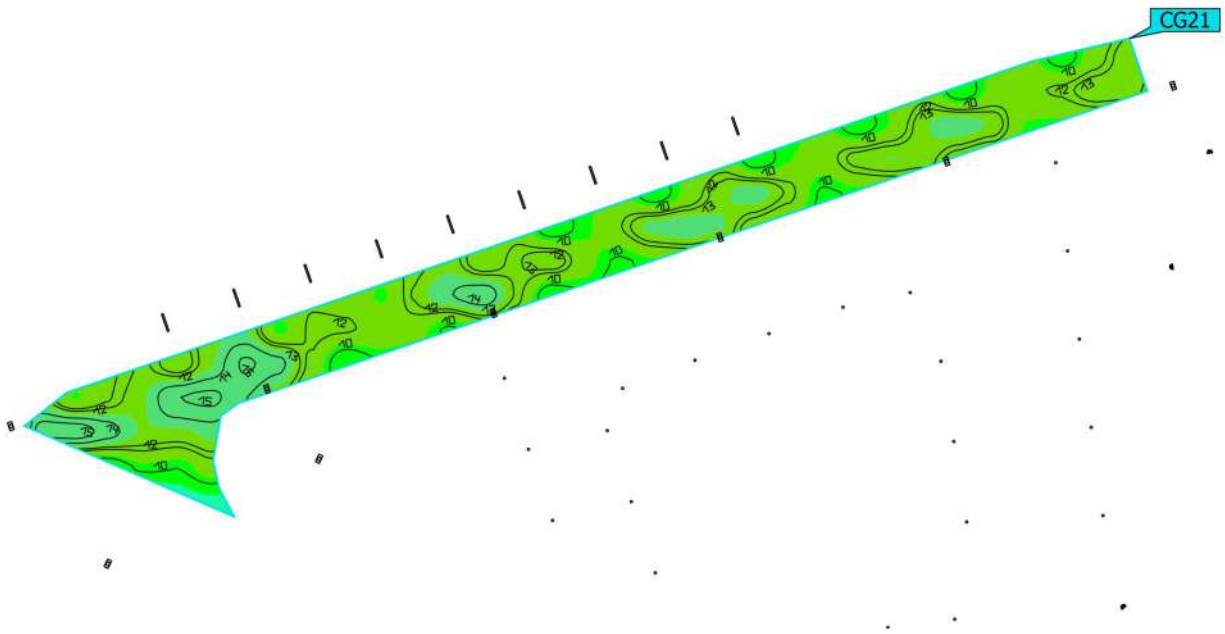


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Vehicular access Perpendicular illuminance Height: 0.000 m	12.1 lx	7.67 lx	20.7 lx	0.63	0.37	CG20

(Light scene 1)

Vehicular access

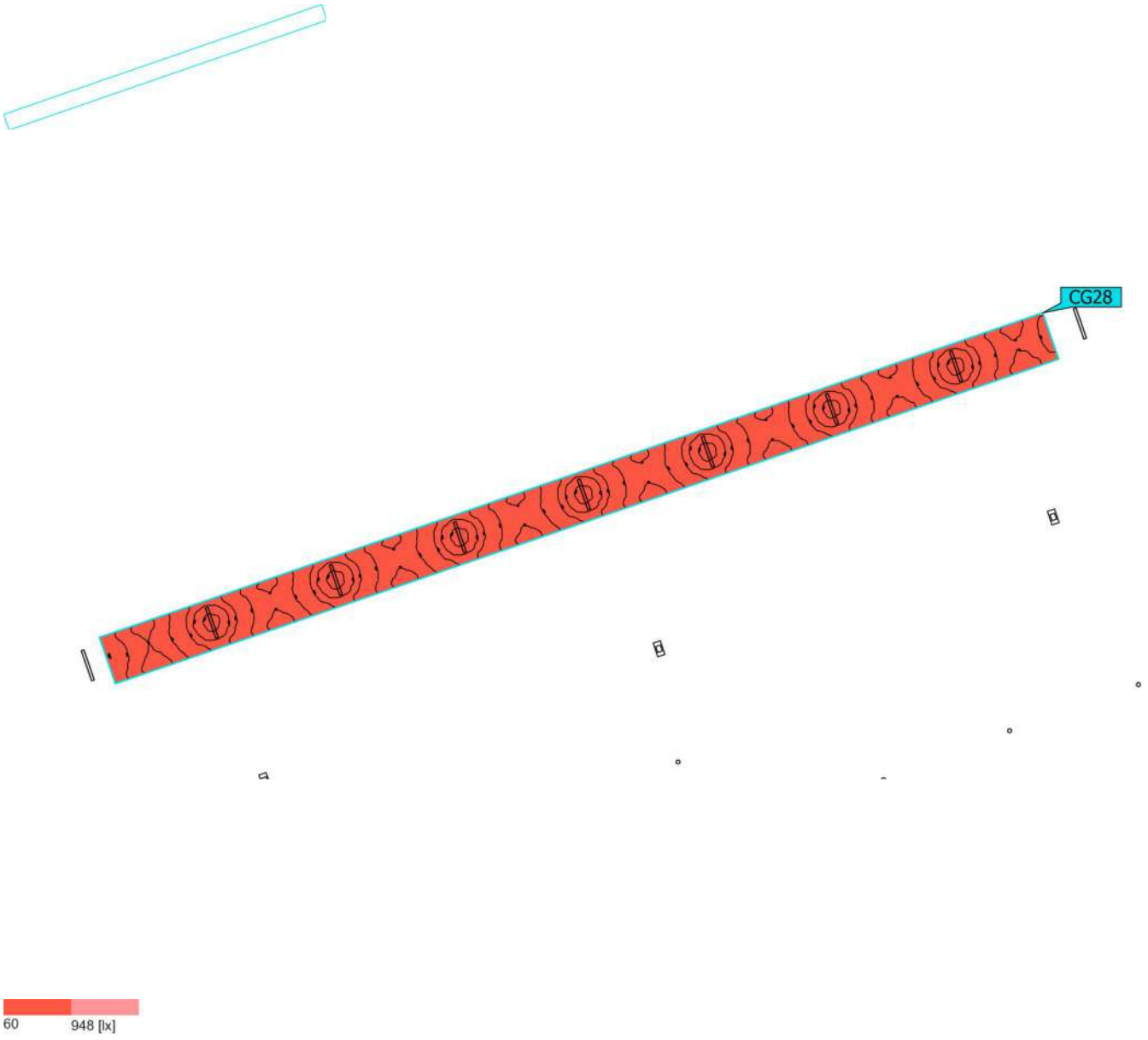




Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Vehicular access Perpendicular illuminance Height: 0.000 m	12.0 lx	8.20 lx	15.7 lx	0.68	0.52	CG21

(Light scene 1)

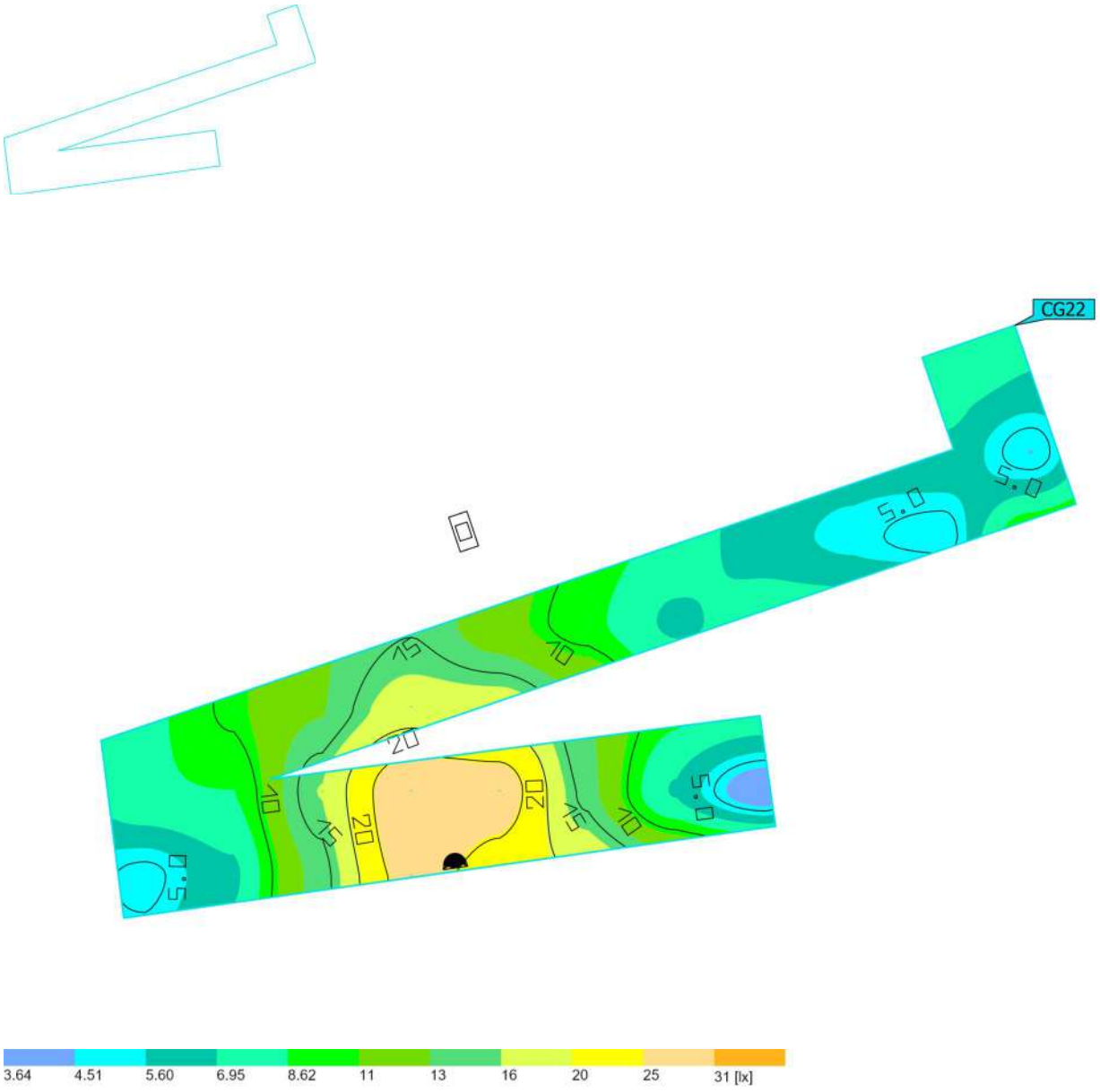
Bicycle park



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Bicycle park Perpendicular illuminance Height: 0.800 m	122 lx	66.2 lx	210 lx	0.54	0.32	CG28

(Light scene 1)

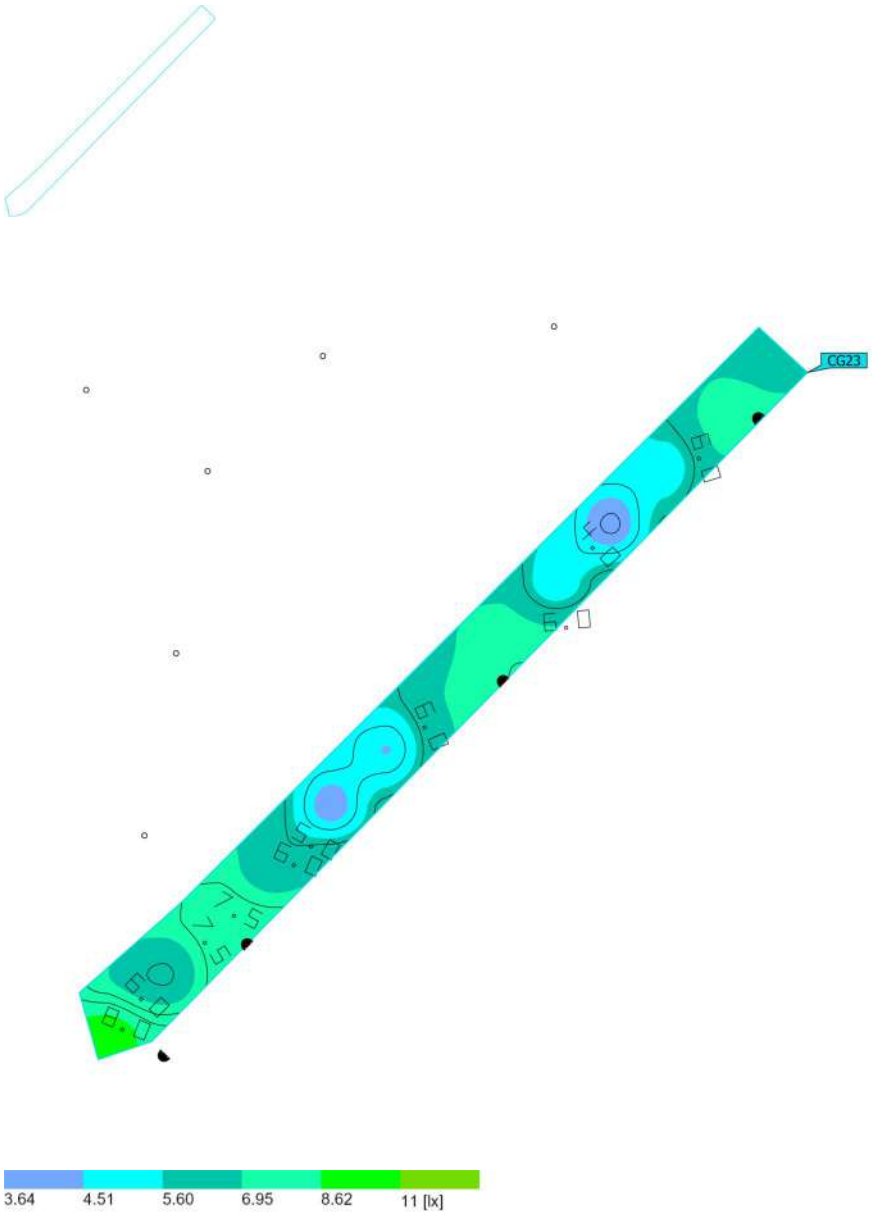
Secondary route



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	11.5 lx	3.66 lx	29.0 lx	0.32	0.13	CG22

(Light scene 1)

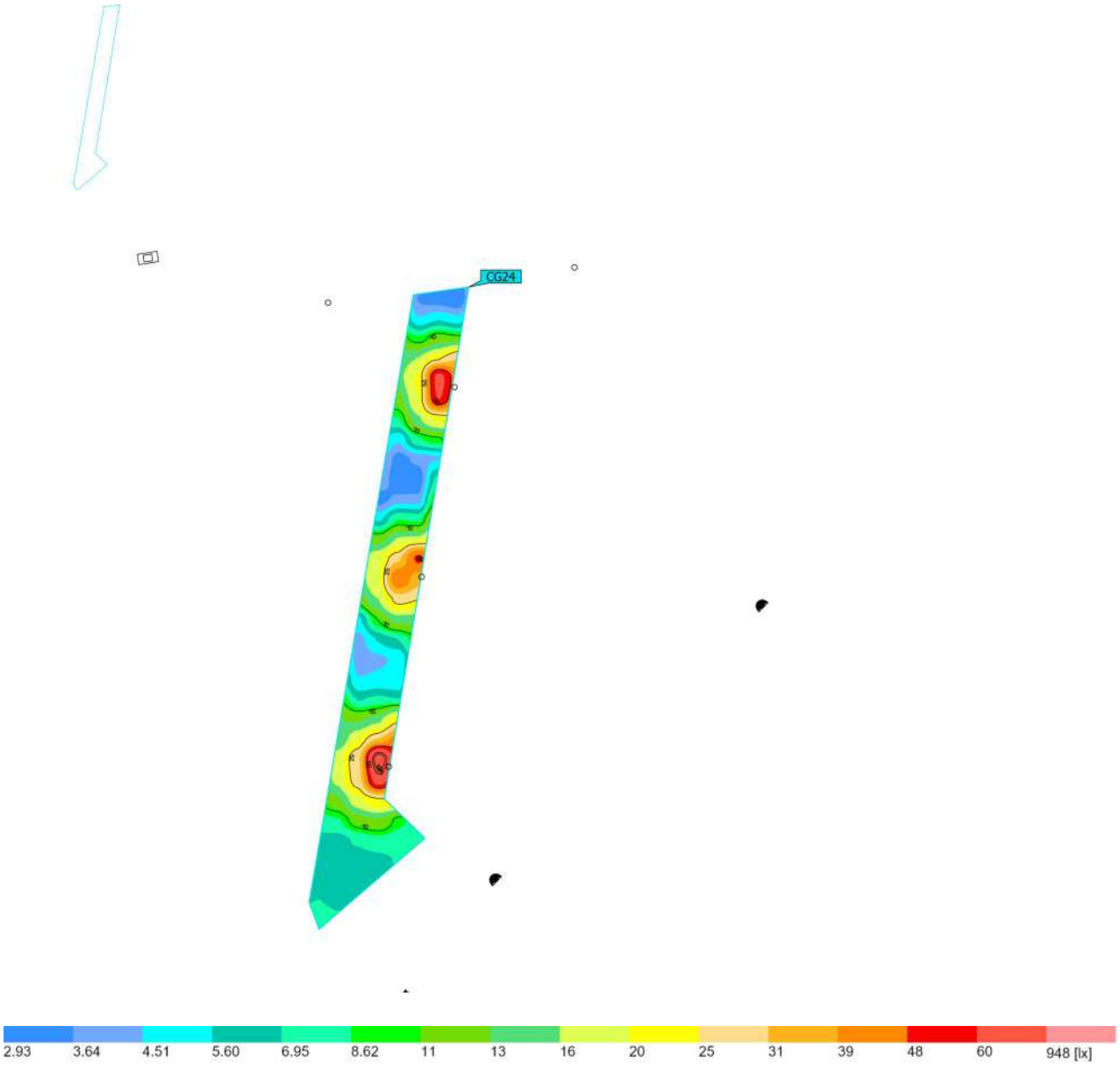
Secondary route



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	6.27 lx	3.85 lx	9.07 lx	0.61	0.42	CG23

(Light scene 1)

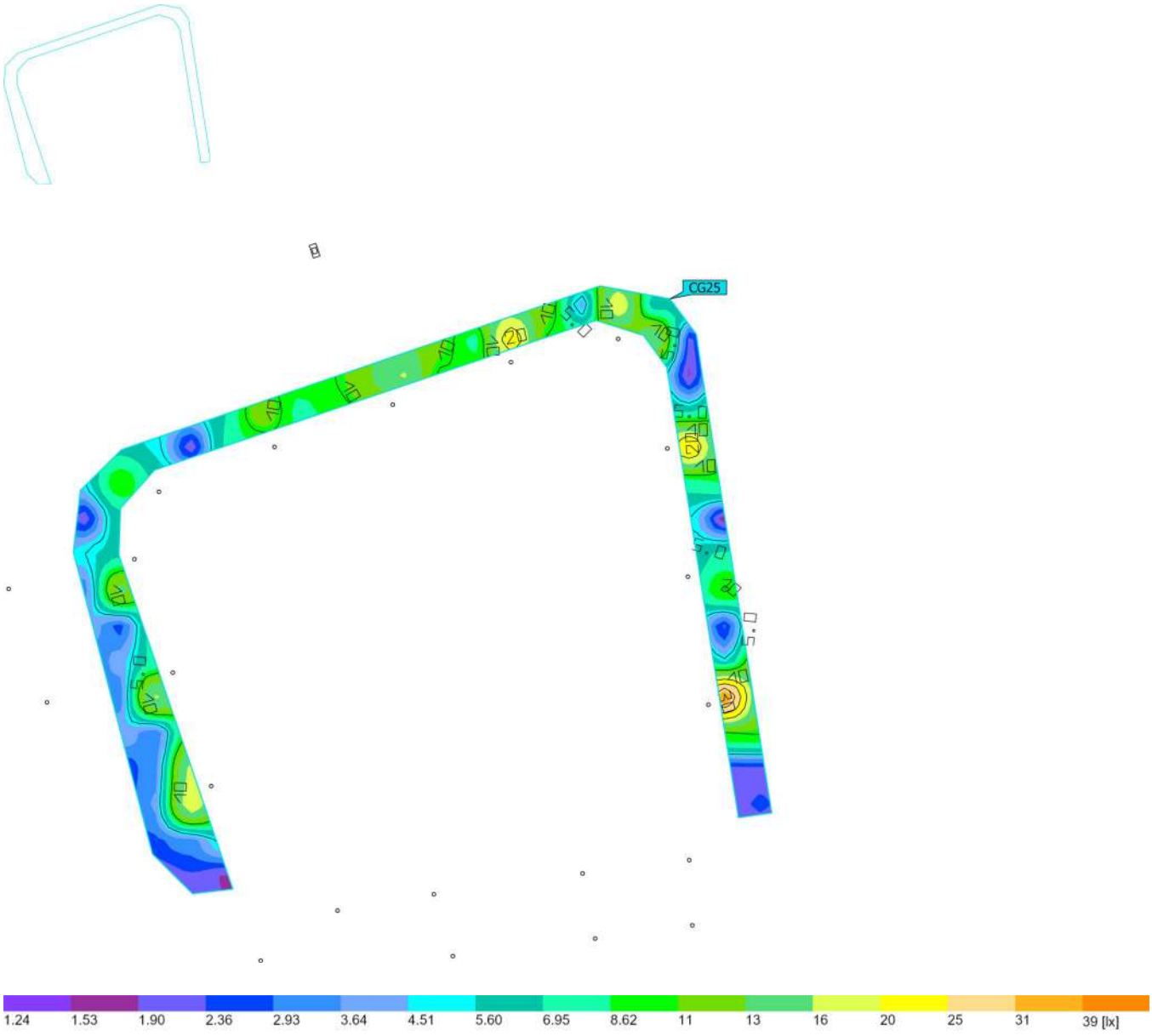
Secondary route



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	14.3 lx	2.94 lx	87.9 lx	0.21	0.033	CG24

(Light scene 1)

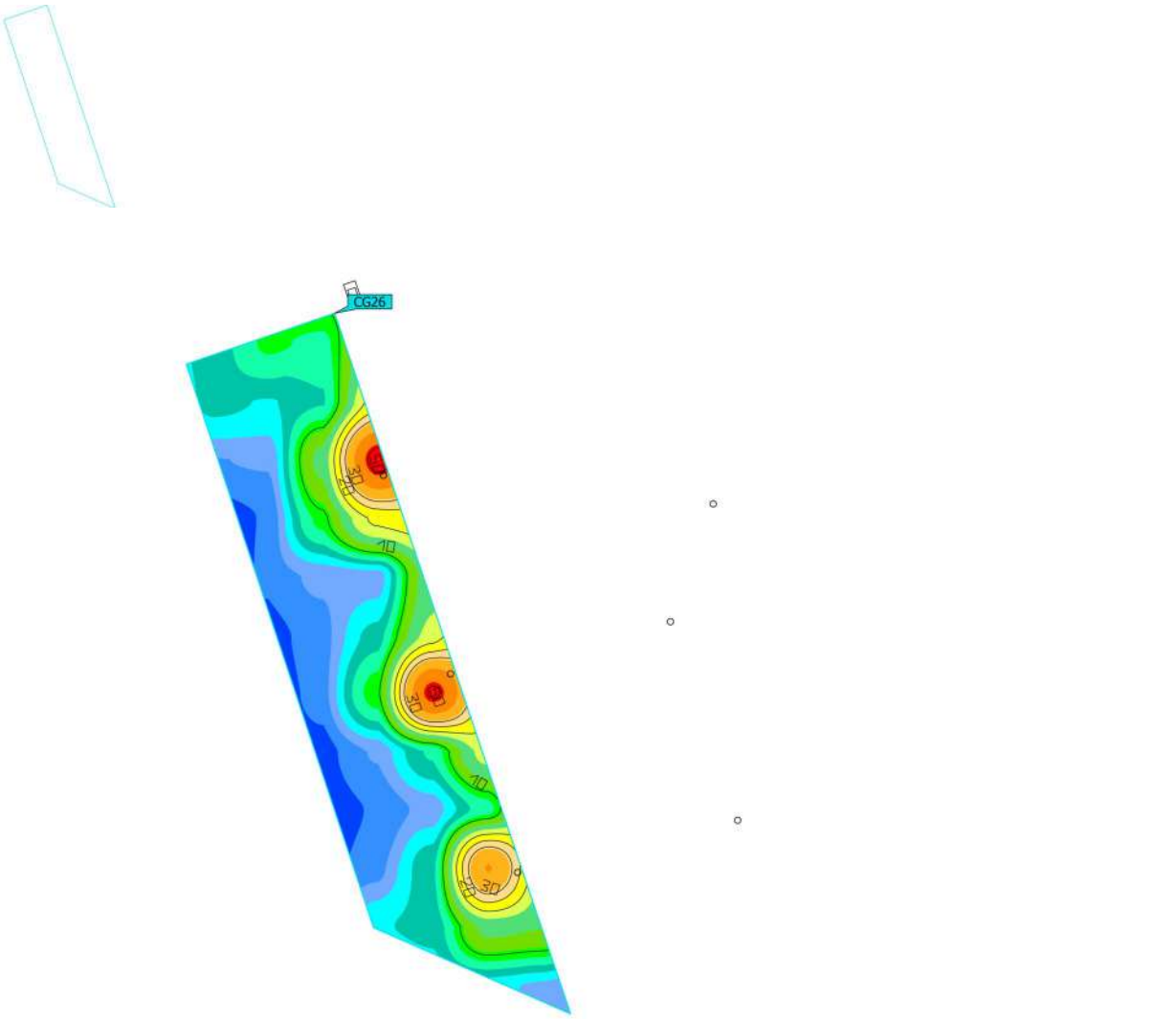
Dwell area



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Dwell area Perpendicular illuminance Height: 0.000 m	8.31 lx	1.52 lx	34.6 lx	0.18	0.044	CG25

(Light scene 1)

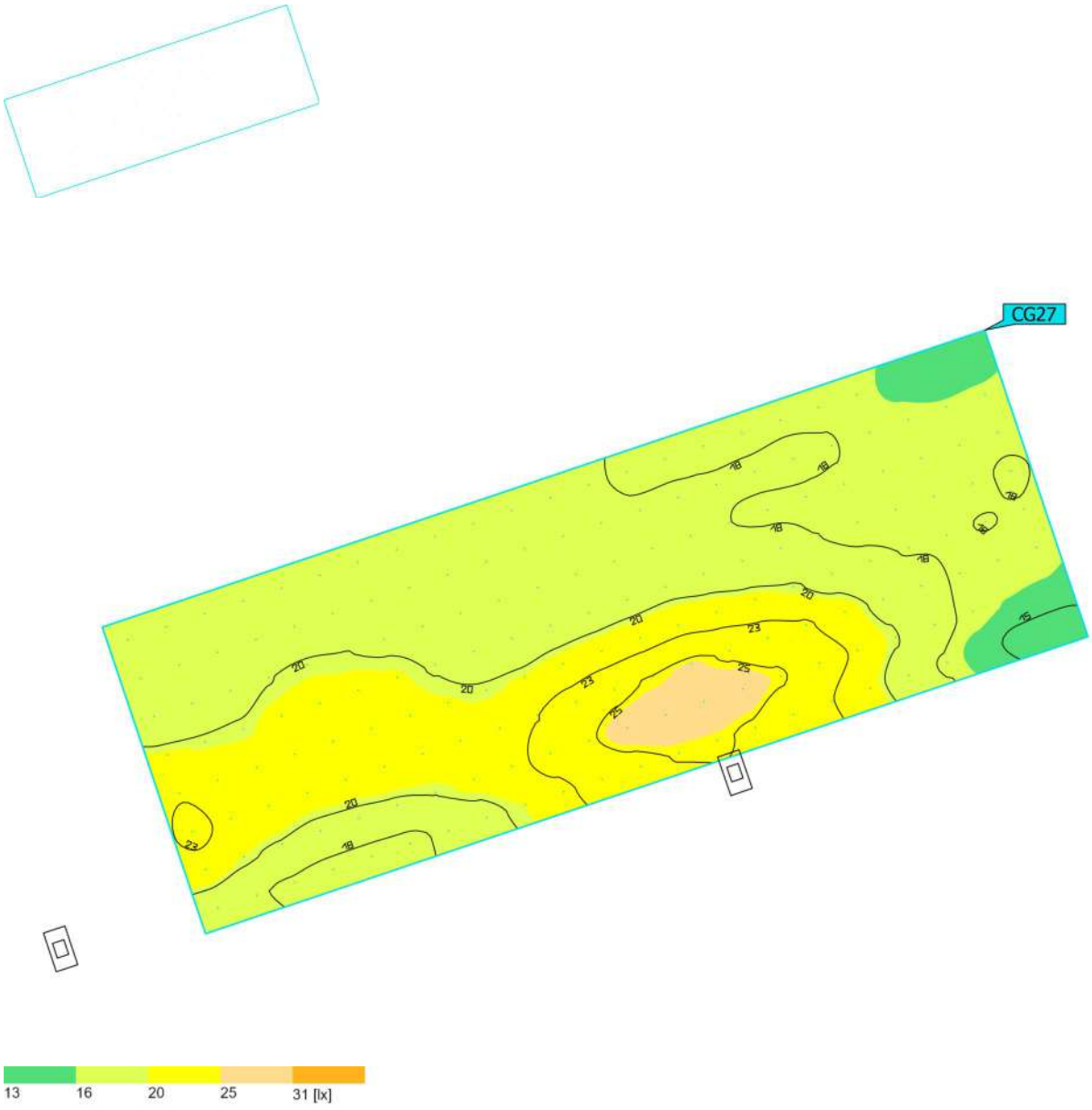
Secondary route



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Secondary route Perpendicular illuminance Height: 0.000 m	10.6 lx	2.59 lx	53.2 lx	0.24	0.049	CG26

(Light scene 1)

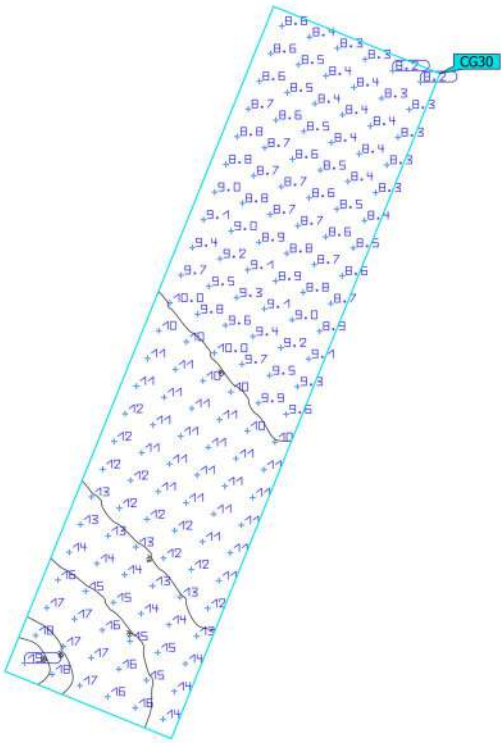
Accessible parking



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Accessible parking Perpendicular illuminance Height: 0.000 m	19.5 lx	14.4 lx	26.5 lx	0.74	0.54	CG27

(Light scene 1)

Conflict



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Conflict Perpendicular illuminance Height: 0.000 m	10.9 lx	8.21 lx	18.5 lx	0.75	0.44	CG30

Notes on planning:
The calculation of the results is based purely on the direct light component. The effect of reflected light has not been considered.

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