External Lighting Strategy Report

CTL Foodstore Cribbs Triangle

P2317-B20-XX-ZZ-RP-ME-00002

BOX TWENTY

Contact

Matt McCarron
Senior Engineer

mmccarron@boxtwenty.co.uk

0778 8248 435

2nd Floor, Mariner House
62 Prince Street, Bristol
BS1 4QD

Issue/Rev	P0	P1
Remarks	Draft for Comment	Issue for Planning
Date	19.05.20	14.07.20
Prepared by	M. McCarron	M. McCarron
Checked by	D. Mitchell	D. Mitchell
Authorised by	P. Weston	P. Weston
Project Number	P2317	P2317

Contents

Appendices

1. Executive Summary

This report is prepared by Box Twenty Consulting Engineers Ltd to set out the proposed external lighting strategy for the Lidl Cribs Triangle development.

The project scope includes 1no. building of 1 storey plus mezzanine in height comprising purpose-built retail usage for the retailer Lidl. The ground floor of the building includes retail floorspace, bin and cycle stores, plant rooms, and car parking. The external areas of the building encompass a plant enclosure, service bay, car parking with associated vehicle and pedestrian routes

The report identifies the design criteria (comprising of codes, standards and best practice) which are associated with the proposed external lighting design and minimising light pollution.

This report also identifies and reviews and project specific planning conditions and other Local Authority documents that may influence the external lighting design.

The verge bordering the east site boundary to Lidl site may potentially be planned to be a bat highway to allow bats to move between foraging areas and roosting boxes. For this reason the external lighting to the east walkway of the site to provide security shall be angled downwards to reduce illuminance spilling beyond the site boundary and incorporate presence detection controls to turn off when no pedestrians are using the walkway.

The design criteria for this project shall be as per those indicated in the Lidl Corporate Electrical Services Specification as follows:

- Car Park; Maintained illuminance of 15 lux, Uniformity 0.25, Measured and floor level
- Canopy/Trolley Bay; Maintained illuminance of 150 lux, Uniformity 0.4, Measured at 1m above floor level

The proposed external lighting shall generally be as per the Lidl design standards and schedule of luminaires, featuring a combination of column-mounted and building mounted luminaires. The Lidl nominated lighting supplier “Signify” is responsible for the design of external lighting for this site.

The lighting shall be controlled via a combination of Photocell, Astronomical programmable timeclock and manual override via the Lidl Building Management System.

The external lighting will be linked to the intruder alarm system so that it shall switch off 15 minutes after the intruder alarm sets and switches back on if there is a confirmed activation of the intruder alarm system during the time period where the external lighting would be switched off.

The proposed development can be provided with an appropriate external lighting solution utilising column mounted luminaires, recessed downlight canopy luminaires and wall mounted luminaires. The solution generally provides illuminance and uniformity that meets the proposed targets identified.

Building regulations will require provision of emergency lighting externally. The emergency lighting provision shall be as per integral conversion versions of the luminaires that also provide the general lighting.

2. Introduction

Box Twenty Consulting Engineers have been appointed to produce a proposed external lighting strategy for the proposed Lidl Site, Cribs Triangle, Bristol project.

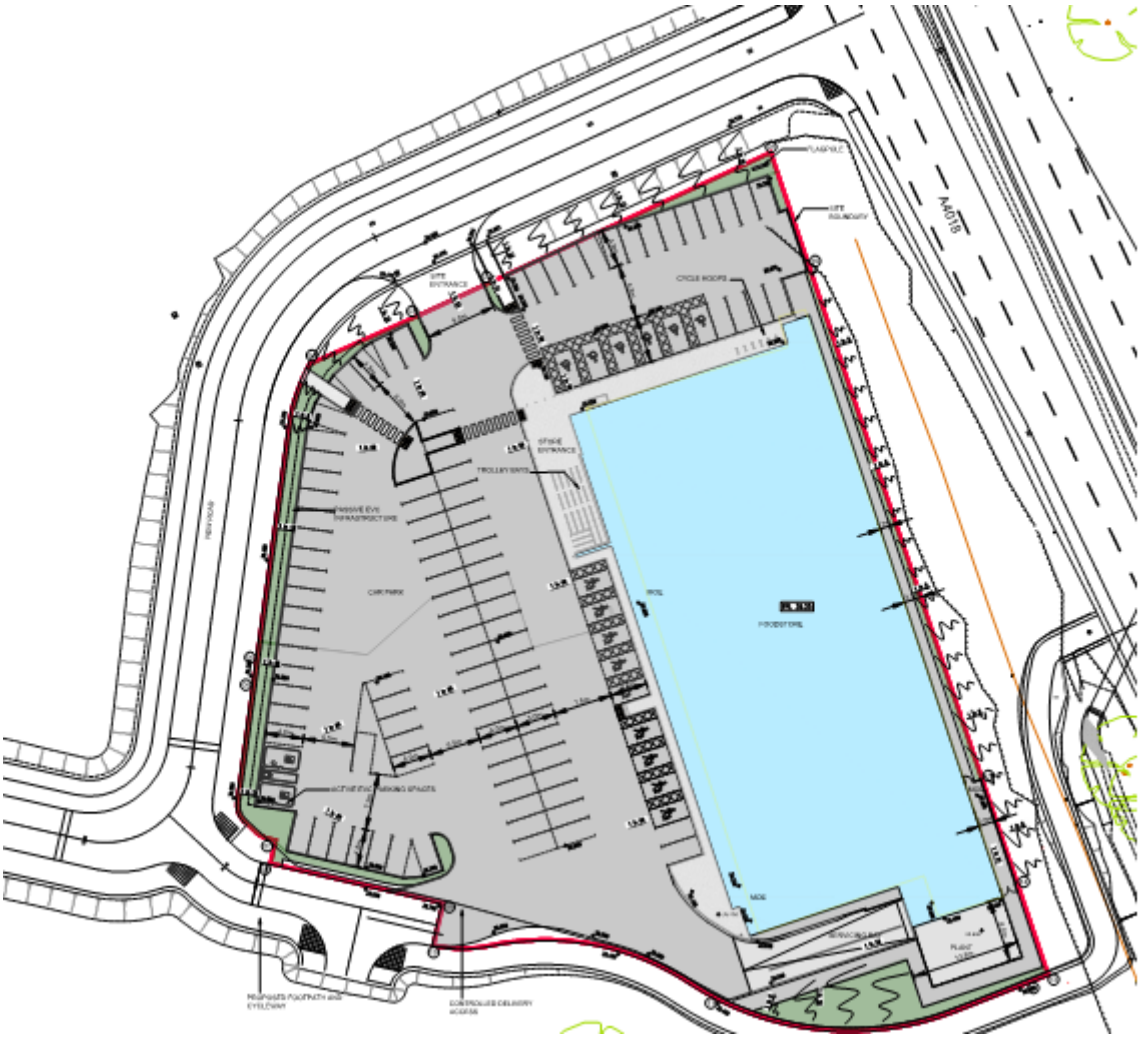


Figure 1 – Development & Project Location / Site Plan

The project scope includes 1no. building of 1 storey plus mezzanine in height comprising purpose-built retail usage for the retailer Lidl. The ground floor of the building includes retail floorspace, bin and cycle stores, plant rooms, and car parking. The external areas of the building encompass a plant enclosure, service bay, car parking with associated vehicle and pedestrian routes.

In recent years, good practice guidance has identified that the growing recognition that excessive, poorly designed and badly aimed lighting may have adverse effects on the external environment at night. Excessive lighting can lead to light encroachment and trespass, sky glow and glare. Excessive quantities of lighting apparatus can spoil daytime views. In addition, lighting can be detrimental to the natural world, by affecting the behaviour of invertebrates, mammals and birds. Therefore, for the proposed development, all lighting design will be carried out in accordance with the latest recommendations and standards.

The report identifies the legal framework, design criteria (comprising of standards, codes, and best practice) and local planning requirements that are associated with the proposed external lighting design and minimising light pollution. This report will have accompanying diagrams identifying a proposed lighting solution for the site.

3. Legal Framework and Existing Guidance

The Clean Neighbourhoods and Environment Act 2005 contains a range of measures to improve the quality of the local environment by giving Local Authorities and the Environment Agency additional powers to deal with a range of issues which, significantly, includes light pollution. The particular light pollution issue it highlights is that related to light spillage from buildings within the Act, and the notes from DEFRA which accompany the Act, clarify this in the following terms:

'Measure proposed – It is proposed to extend the list of statutory nuisances to include artificial light and nuisance caused by insects. Artificial light that was prejudicial to health or a nuisance would become a statutory nuisance. The measure on artificial light would apply to light emitted from residential, commercial and industrial premises, but with exemptions for premises used for activities for which artificial light is essential or required by legislation for operational, security or health and safety reasons, and street lighting. This measure would extend existing duties of local authorities under EPA 1990'

Further - *'Including these as statutory nuisances allow local authorities to serve nuisance abatement notices on those responsible for contraventions in respect of nuisance lighting and nuisance from insects. It would also allow for individuals to institute proceedings through a magistrates' court.'*

Finally, The Act highlights the benefits of controlling light pollution –
Artificial Light: Benefits

- Reduction of light nuisance.
- Promotion of good practice and improved relationships between neighbours in some cases.

The key statements within the DEFRA guidance, which accompany the Act and were published in 2007, are as follows:
"85. Local authorities have a duty to take reasonable steps, where practicable, to investigate any complaints of artificial light nuisance; it is expected that the following sources will generate most complaints:

- Domestic security lights.
- Commercial security lights.
- Healthy living and sports facilities.
- Domestic decorative lighting.
- Exterior lighting of buildings and decorative lighting of landscapes.
- Laser shows / sky beams / light art.

However, the guidance goes on to say:
"88. Efficient and high-quality lighting installations that help people to see where they are going and bring security to both themselves and their property can be designed to produce minimal impact on the environment. The management and maintenance of such lighting that limits both glare and dark shadows is also essential for people with a visual impairment."

and,

"90. Artificial light nuisance may be, but is not necessarily, the same as light pollution. Artificial light nuisance is a source of light that in the opinion of a trained public health professional, who makes an assessment on a case by case basis, interferes with someone's use of their property, and / or is or might be prejudicial to someone's health."

The proposed development of this site offers an opportunity in creating a sensitive solution that considers all the many issues outlined in the paragraphs above from The Clean Neighbourhoods and Environment Act 2005.

4. Design Criteria Reference Documents

The lighting design criteria for the proposed development shall be in line with the appropriate British Standards and guidance published by the Institution of Lighting Professionals (ILP) and Society of Light and Lighting (SLL). In addition, Local Authority planning guidance and strategies shall be reviewed for any specific requirements or limitations, as well as any project specific restrictions that may apply from the planning permission. The following summarises the documents reviewed and the relevant criteria applicable to this project.

BS5489-1: Lighting of Roads and Public Amenity Areas and BS EN 12464:1 – Lighting of Work Places.
The design lux levels indicated later in this report for external areas have generally been selected in accordance with the above standard and guidance document. This is as prescribed in the Lidl standard specification.

Guidance Notes for the Reduction of Obtrusive Light, GN01/20, The Institution of Lighting Professionals
This recently updated guidance note sets out design parameters for minimising light pollution and recommends suitable and appropriate lighting and luminaire solutions that minimises upward light and glare for neighbouring properties.

The guidance recommends that the Local Planning Authority specify the environmental zones for exterior lighting control. The figure below from the guidance shows the definitions of the 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, or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

Table 1 – Environmental Zones

At this stage of the design process we have not been advised of the environmental zones for exterior lighting control, so we propose an assumption that will need comment from the Local Planning Authority. Based on the location of the project we suggest the project would be *Zone E3, Suburban*.

With a proposed Environmental Zone E3 selected for this project, the guidance proposes limitations which the proposed external lighting design should achieve.

The requirements are shown in the table below.

Environmental Zone	Maximum values of vertical illuminance on Properties, Pre-curfew	Maximum values of vertical illuminance on Properties, Post-curfew	Limit for the luminous intensity of bright Luminaires, Pre-curfew	Limit for the luminous intensity of bright Luminaires, Post-curfew	Maximum values of upward light ratio (ULR) of luminaires	Maximum values of upward flux ratio (UFR) of installation (amenity lighting)
E3	10 Lx	2 Lx	Varies (max 10,000 cd)	Varies (max 1,000 cd)	5 %	12 % *see below

Table 2 – Summary of Obtrusive Light Limitations

** Current guidance from the ILP is that the Upward Flux Ratio is only required to be calculated for sites in proximity to observatories, or for sites in zones E0 or E1 which abut an E0 zone. In addition, it is highly dependant upon the reflectance of ground surfaces, which can vary considerably outdoors, and cannot be easily calculated. Therefore the Upward Flux Ratio does not apply to this project.*

Note that the limit on luminaire luminous intensity depends on the size of the luminaire and the distance to the observer, but the value stated is the upper limit.

South Gloucestershire Local Plan 2006-2027, Core Strategy

We have reviewed the South Gloucestershire Local Plan 2006-2027. The document contains no guidance on lighting so will not be considered for this scheme.

NPA Ecology Survey 2018

The east verge of the highway to the east of the Lidl site may potentially be planned to be a bat highway to allow bats to move between foraging areas and roosting boxes. For this reason the external lighting to the east walkway of the site shall not emit luminance beyond the highway boundary. There are no further considerations with respect to bat conservation that would influence the external lighting design.

5. Project Specific Design Criteria

The design criteria for this project shall be selected as per those indicated in the Lidl Corporate Electrical Services Specification listed below. The Lidl specification references the requirements of BS5489-1: Lighting of Roads and Public Amenity Areas and BS EN 12464:1 – Lighting of Work Places and the design lux levels below are based on the guidance in these documents.

	Maintained Illuminance (E_m lux)	Uniformity (U_o)	Working Plane
Car Park Generally	15	0.25	Floor Level
Canopy / Trolley Bay	150 Lux	0.4	@1m Affl

Table 3 – Design Criteria

These levels meet and exceed the minimum lux and uniformity requirements of BS5489-1: Lighting of Roads and Public Amenity Areas and BS EN 12464:1 – Lighting of Work Places.

The designer shall fully consider the aforementioned standards and incorporate their recommendations into the detailed lighting design.

6. Proposed Lighting Strategy

The proposed external lighting shall generally be as per the Lidl design standards and schedule of luminaires featuring a combination of column-mounted and building mounted luminaires. The Lidl nominated lighting supplier "Signify" is responsible for the design of external lighting for this site.

The luminaire types proposed are decorative but robust. Columns have been located to avoid vehicle and pedestrian routes.

The luminaires proposed are as follows:

Luminaire Reference	Image	Description	Proposed Mounting Height
1		Column single lantern for urban LED lighting. Fixing, canopy and body in powder coated die-cast aluminium. Post top mounted lantern with downward optic to provide 0% upward light ratio. 31W, 4165Lm. As Phillips Lumistreet LED.	6m
2		Column twin lantern for urban LED lighting. Fixing, canopy and body in powder coated die-cast aluminium. Post top mounted lantern with downward optic to provide 0% upward light ratio. 31W, 4165Lm. As Phillips Lumistreet LED.	6m
3		Wall mounted 1300mm waterproof linear fitting with white polycarbonate diffuser 18W, 2300Lm. As Phillips Pacific LED.	3.1m
4		Wall mounted 1300mm waterproof linear fitting with white polycarbonate diffuser with 3hr emergency pack. 18W, 2300Lm. As Phillips Pacific LED.	3.1m
5		Recessed IP54 200mm downlight with high gloss mirror optic. 14.2W, 2200Lm. As Phillips Luxspace recessed downlight	Recessed to canopy
6		Recessed IP54 200mm downlight with high gloss mirror optic and 3hr emergency pack. 14.2W, 2200Lm. As Phillips Luxspace recessed downlight	Recessed to canopy
7		Linear LED profile signage illuminator with downward optic achieving 0% upward light ratio. 103.8W, 7410Lm. As Portland Lighting Ecolux LED Mini	Mounted to top of billboard (various heights)

Table 4 – Proposed Luminaires

The lighting shall be controlled via a combination of Photocell, Astronomical programmable timeclock and manual override via the Lidl Building Management System. This will prevent the lighting being operational when there is adequate daylight and the lighting could be programmed to be off for a set period if required.

The external lighting will be linked to the intruder alarm system so that it shall switch off 15 minutes after the intruder alarm sets and switches back on if there is a confirmed activation of the intruder alarm system during the time period where the external lighting would be switched off.

Building regulations will require provision of emergency lighting externally. The emergency lighting provision shall be as per integral conversion versions of luminaires that also provide the general lighting.

7. Conclusions

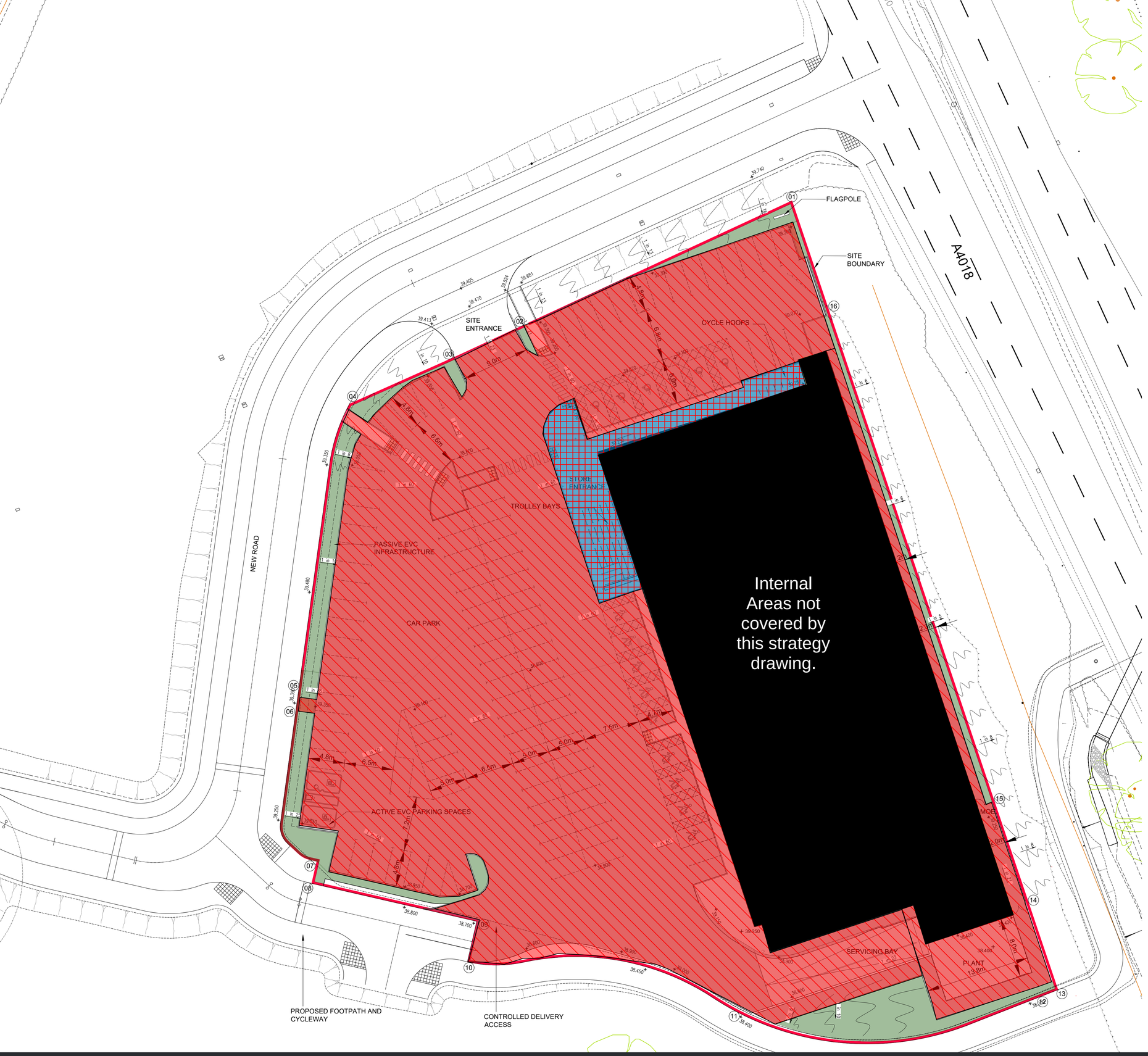
The proposed development can be provided with an appropriate external lighting solution utilising column mounted luminaires, recessed downlight canopy luminaires and wall mounted luminaires. The solution generally provides illuminance and uniformity that meets the proposed targets identified. Emergency lighting will be provided to meet the requirements of BS5266 as detailed in the designer's calculations.

The overall solution is able to meet the limits for Sky Glow. The lighting strategy has been developed in recognition of the Masterplan and that new dwellings, a community centre, and public open space will neighbour/overlook the site. The foodstore phase is coming forward first so there will not be opportunity to further consider lighting in the context of neighbouring properties.

The lighting should be controlled via a combination of Photocell, Astronomical programmable timeclock and manual override switch (used for testing purposes). This will prevent the lighting being operational when there is adequate daylight and the lighting could be programmed to be off for a set period if required.

Appendix A

External Lighting Strategy Plan
REF 2317-B20-ST-ZZ-DR-E-70890



Legend

- Building
- Car Park
- Canopy / Trolley Bay

Design Criteria

	Maintained Illuminance (E_m lux)	Uniformity (U_o)	Working Plane
Car Park Generally	15	0.25	Floor Level
Canopy / Trolley Bay	150 Lux	0.4	@1m Affl

Notes

Please refer to External Lighting Strategy Report REF 2317-B20-XX-ZZ-RP-ME-00002 for further details of external lighting strategy and luminaire types.

Please refer to External Lighting Layout Drawing REF 2317-B20-ST-ZZ-DR-E-70891 for luminaire layout arrangement and lux plots.

BOX TWENTY

Project Name	CTL Foodstore	Drawing Title	External Lighting Strategy Drawing - Rev02
Project Number	P2317	Checked By	D.Mitchell
		Drawn By	M.McCarron
		Date	14.07.2021

Appendix B

External Lighting Layout and Lux Plots Drawing REF 2317-B20-ST-ZZ-DR-E-70891

LiAS Design Notes

This preliminary design is produced by the Lighting Application Specialist (LiAS) team of Signify UK&I based on information supplied by the Customer for the purpose of identifying suitable products and costing the proposal. This design cannot be used for Construction, as this design does not purport to eliminate health and safety risks as a CDM Regulation risk assessment has not been undertaken.

Depending on the level of information received, a number of assumptions may have been applied in order to create an indicative lighting proposal and costing model, according to lighting industry guidelines and incorporating industry best practice methods. These assumptions are documented below and will require confirmation by the Principle Designer or PSDP (which are not Signify UK&I) during the detailed design phase.

Project Specific Assumptions

- Where 'Lighting Classes' have not been provided/specified, the calculations have been produced using the Lidl Specification.
- Signify has not undertaken any emergency lighting calculations. Luminaires marked as emergency fittings are for indicative purposes only. It is the responsibility of the Principle Designer to ensure emergency lighting calculations are performed and that all emergency evacuation routes are lit to a suitable standard.

Generic Assumptions (unless specifically informed differently)

- Preliminary Design proposals produced by the Signify LiAS Team are not to be used for installation purposes. It is the responsibility of the Principle Designer and/or Principle Contractor to ensure all Installation and Maintenance can be done in a safe manner, carried out by competent persons, based on their agreed Risk Assessments and Method Statements.
- The Luminaire Maintenance Factors have been based on 6-year cleaning intervals within an E3/E4 Environmental Zone and it is assumed that lamp/luminaire failures will be replaced on a 'spot replacement'.
- Energy consumptions have been based on the luminaire/s having Constant Light Output (CLO) enabled and the quoted wattage/s are the average over 100,000 hours (without dimming).
- The design calculations produced by Signify do not account for the effect obstructions, such as trees, will cause.
- Signify has not been provided with utility plans showing Buried, Above Ground or Overhead utilities. Therefore, all column/luminaire locations are indicative and are subject to review/verification by the Principle Designer.
- Unless stated otherwise, Signify has not visited site. Therefore, all column/luminaire locations are indicative and are subject to an onsite verification arranged/performed by the Principle Designer.
- Signify has not produced any Private Cable Network electrical calculations or reviewed the DNO network to confirm power supplies to the proposed lighting.
- Signify has not performed any asset condition testing and therefore assumes that any existing lighting columns/wall mounted brackets are structurally capable of supporting the weight & windage of the proposed luminaire/s. This must be verified by the Principle Designer before installation works commence.
- Unless stated otherwise, Signify is not supplying the new lighting columns (including brackets etc) and therefore it is the responsibility of the Principle Designers to confirm that all proposed equipment is suitable for the intended locations (e.g. raise & lower, ground condition, foundation type, saline environment, etc).
- Unless stated otherwise, luminaires will be supplied in their standard colour.

Luminaire Schedule

Single LL-A BL2

1 lamp(s) per luminaire, 7500 initial lumens per lamp
Maintenance Factor = 0.760, watts per luminaire = 0
Outreach (from mounting axis to photometric center)= 400 mm
mounting height= 6 m
number locations= 2, number luminaires= 2

Twin LL-C

1 lamp(s) per luminaire, 7500 initial lumens per lamp
Maintenance Factor = 0.760, watts per luminaire = 0
Outreach (from mounting axis to photometric center)= 900 mm
tilt angle= 5 deg
mounting height= 6 m
number locations= 3, number luminaires= 6

LL-E
Emergency Version

1 lamp(s) per luminaire, 2300 initial lumens per lamp
Maintenance Factor = 0.800, watts per luminaire = 17
Outreach (from mounting axis to photometric center)= 0 mm
mounting height= 3.25 m
number locations= 11, number luminaires= 11

Single LL-C

1 lamp(s) per luminaire, 7500 initial lumens per lamp
Maintenance Factor = 0.760, watts per luminaire = 0
Outreach (from mounting axis to photometric center)= 400 mm
tilt angle= 5 deg
mounting height= 6 m
number locations= 9, number luminaires= 9

LL-E

1 lamp(s) per luminaire, 2300 initial lumens per lamp
Maintenance Factor = 0.800, watts per luminaire = 17
Outreach (from mounting axis to photometric center)= 0 mm
mounting height= 3.25 m
number locations= 11, number luminaires= 11

LL-Canopy

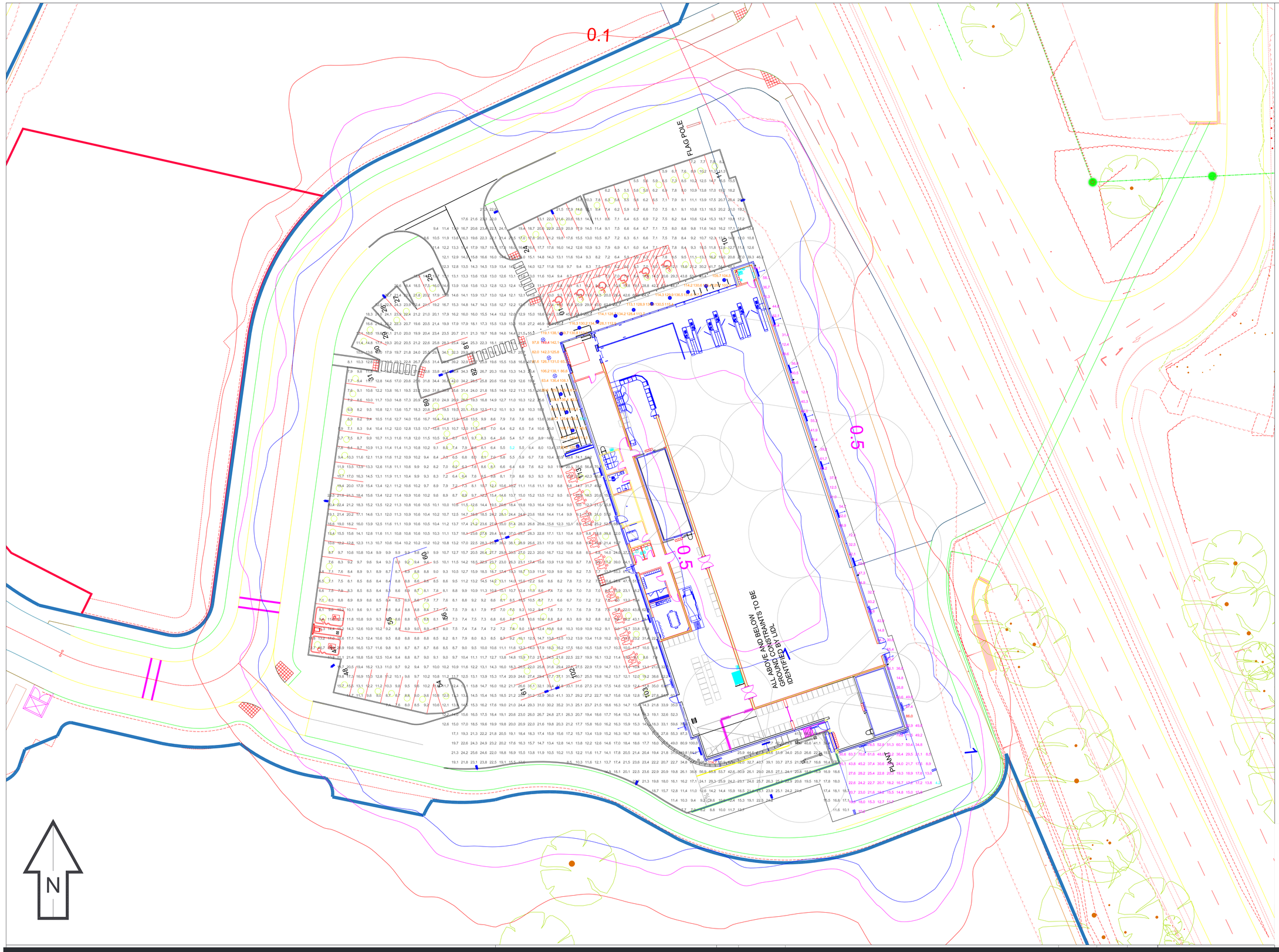
1 lamp(s) per luminaire, 2100 initial lumens per lamp
Maintenance Factor = 0.800, watts per luminaire = 18
Outreach (from mounting axis to photometric center)= 0 mm
mounting height= 3.25 m
number locations= 14, number luminaires= 14

LL-Canopy
Emergency Version

1 lamp(s) per luminaire, 2100 initial lumens per lamp
Maintenance Factor = 0.800, watts per luminaire = 18
Outreach (from mounting axis to photometric center)= 0 mm
mounting height= 3.25 m
number locations= 3, number luminaires= 3

Philips Lighting Contacts

Richard Fortune, Key Account Manager - 07787 004900 - Richard.Fortune@Signify.com
Mark Davies, Lighting Application Specialist - 07979935894 - Mark.Davies@Signify.com
Quotes & Orders - 01483 446070 - Lighting.Sales.Outdoor@Signify.com



Key:

Single LL-A BL2

1 lamp(s) per luminaire, 7500 initial lumens per lamp
Maintenance Factor = 0.760, watts per luminaire = 0
Outreach (from mounting axis to photometric center)= 400 mm
mounting height= 6 m
number locations= 2, number luminaires= 2

LL-E
Emergency Version

1 lamp(s) per luminaire, 2300 initial lumens per lamp
Maintenance Factor = 0.800, watts per luminaire = 17
Outreach (from mounting axis to photometric center)= 0 mm
mounting height= 3.25 m
number locations= 11, number luminaires= 11

LL-E

1 lamp(s) per luminaire, 2300 initial lumens per lamp
Maintenance Factor = 0.800, watts per luminaire = 17
Outreach (from mounting axis to photometric center)= 0 mm
mounting height= 3.25 m
number locations= 11, number luminaires= 11

LL-Canopy
Emergency Version

1 lamp(s) per luminaire, 2100 initial lumens per lamp
Maintenance Factor = 0.800, watts per luminaire = 18
Outreach (from mounting axis to photometric center)= 0 mm
mounting height= 3.25 m
number locations= 3, number luminaires= 3

Twin LL-C

1 lamp(s) per luminaire, 7500 initial lumens per lamp
Maintenance Factor = 0.760, watts per luminaire = 0
Outreach (from mounting axis to photometric center)= 900 mm
tilt angle= 5 deg
mounting height= 6 m
number locations= 3, number luminaires= 6

Single LL-C

1 lamp(s) per luminaire, 7500 initial lumens per lamp
Maintenance Factor = 0.760, watts per luminaire = 0
Outreach (from mounting axis to photometric center)= 400 mm
tilt angle= 5 deg
mounting height= 6 m
number locations= 9, number luminaires= 9

LL-Canopy

1 lamp(s) per luminaire, 2100 initial lumens per lamp
Maintenance Factor = 0.800, watts per luminaire = 18
Outreach (from mounting axis to photometric center)= 0 mm
mounting height= 3.25 m
number locations= 14, number luminaires= 14

Canopy
70 points at z=0, sp 1.5m by 1.5m
HORIZONTAL LUX

Average	114.5
Maximum	149.4
Minimum	59.0
Min/Avg(Uo)	0.515
Min/Max	0.395
Coef Var	0.209
UnifGrad	2.14

Rear Walkway / Plant Area
115 points at z=0, sp 1.5m by 1.5m
HORIZONTAL LUX

Average	36.5
Maximum	86.0
Minimum	4.2
Min/Avg(Uo)	0.115
Min/Max	0.049
Coef Var	0.557
UnifGrad	3.38

Car Park / Loading Area
1852 points at z=0, sp 1.5m by 1.5m
HORIZONTAL LUX

Average	17.0
Maximum	114.7
Minimum	5.2
Min/Avg(Uo)	0.306
Min/Max	0.045
Coef Var	0.722
UnifGrad	3.27

signify
PHILIPS interact PHILIPS hue
MODULAR LIGHTING INSTRUMENTS COLORKINETICS

BOX TWENTY

Project Name	CTL Foodstore	Drawing Title	2317-B20-ST-ZZ-DR-E-70891
Project Number	P2317	Checked By	D.Mitchell
Drawn By	M.McCarron	Date	16.07.2021

Box Twenty

mail@boxtwenty.co.uk
accounts@boxtwenty.co.uk

+44 (0) 117 363 7221

2nd Floor, Mariner House
62 Prince Street, Bristol
BS1 4QD

boxtwenty.co.uk