HOARE LEA LIGHTING

RAIL CENTRAL

APPENDIX 21.2 – SRFI Operational Lighting Parameters

APPENDIX 21.2-DOC-1602403-20180301-Rail Central-DDM-IIP 001-P6

March 2018

1.0 External Lighting Parameters

This Appendix has been prepared by Hoare Lea to provide typical lighting arrangements and their locations to the expected uses of the Main SRFI site for assessment purposes.
Applying the precautionary principal, relevant lighting parameters are assessed in terms of obtrusive light impact to the sensitive receptors identified within Appendix 22.1 - Baseline Survey report.

In maintaining the precautionary principal, **Figure 1.1** illustrates the precautionary external lighting parameters relative to Site uses and indicative vehicular and pedestrian routes.

Figure 1.2 illustrates an rendered overview of the indicative operational lighting parameters and **Figure 1.3** illustrates an illuminance overview of the operational lighting for assessment.

Assessment Lighting Elements

- Roundabout / Conflict Zone lighting (CE3)
- Main Access road lighting (ME4a)
- Site Access road lighting (S3)
- HGV parking lighting
- Car parking lighting
- Service Yard lighting
- Loading/Unloading lighting
- Checkpoints
- Express freight platform / Intermodal Terminal

Notes:

- Refer to Section 2.0 for details regarding lighting design development and mitigation measures.
- Refer to Section 3.0 for details regarding lighting design criteria and generic equipment type for each Lighting Element
- In the interests of minimising obtrusive light impacts to natural ecological conditions and visual impact, subject to H&S approval at detailed design stages it is not intended to illuminate the following:
    - Open Spaces (including dog walking area's and playground);
    - Currently unlit footpaths, tracks and bridleways;
    - Existing trees, hedgerows, and woodland;

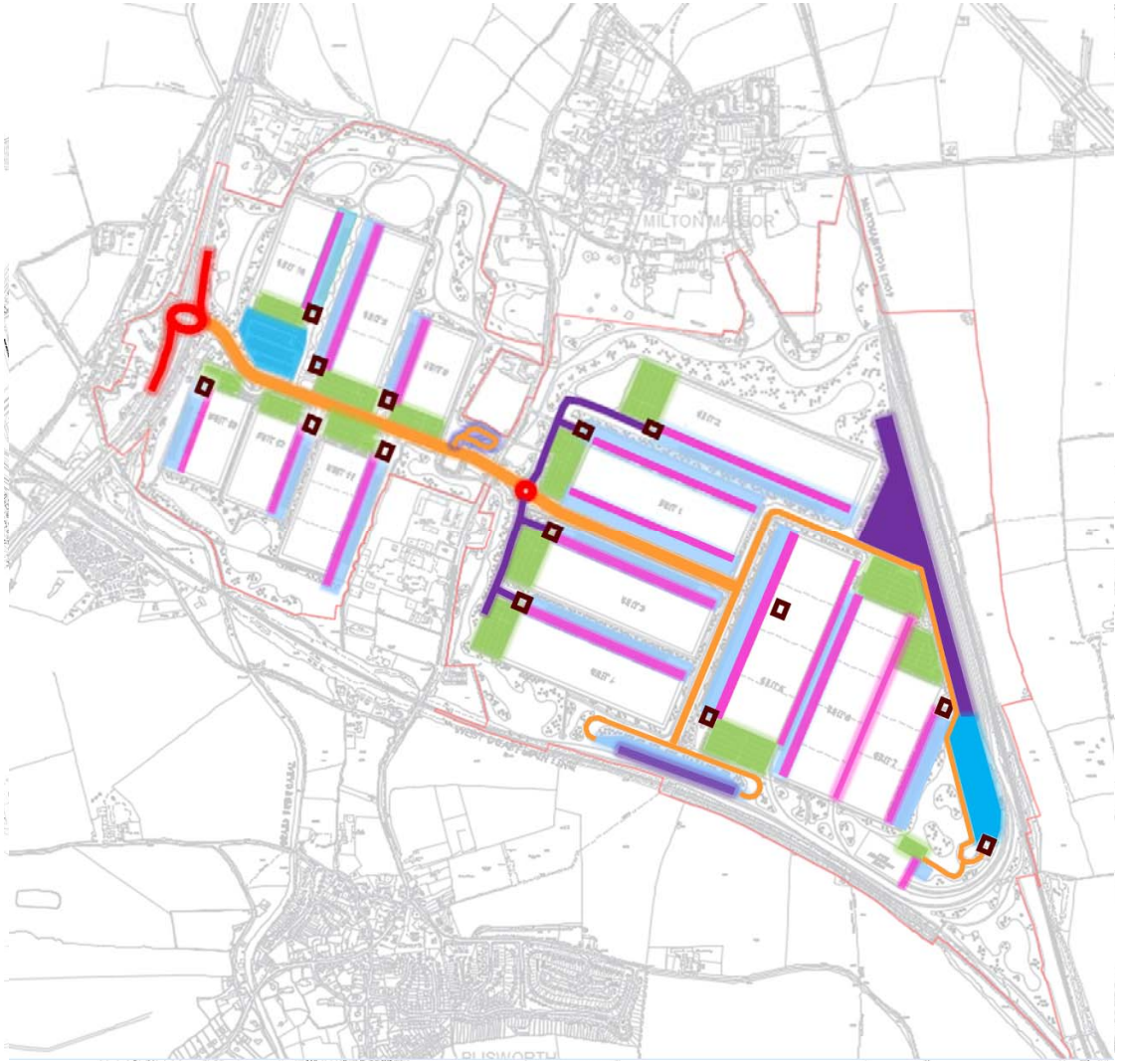


Figure 1.1 – Precautionary External Lighting Parameters for Assessment

1.0 External Lighting Parameters

Indicative External Lighting Parameters – Rendered Overview

Below illustrates an rendered overview of the indicative operational lighting parameters for assessment.

LED Luminaire

Access Roads (S3, ME4a): 8-10m high

Roundabout (Conflict Area CE3): 10m high

HGV Parking Lighting: 12m high

Car Park Lighting: 5m high

Service Yards / Loading / Unloading Bays: 10m high

Checkpoints / Barriers / Weighbridge / Wheelwash: 10m high

Express Freight Cross-Dock platform : 12m high

LED Floodlight

Service Yards / Loading / Unloading Bays: 10m high building mount

Intermodal Terminal: 18m to 20m high column

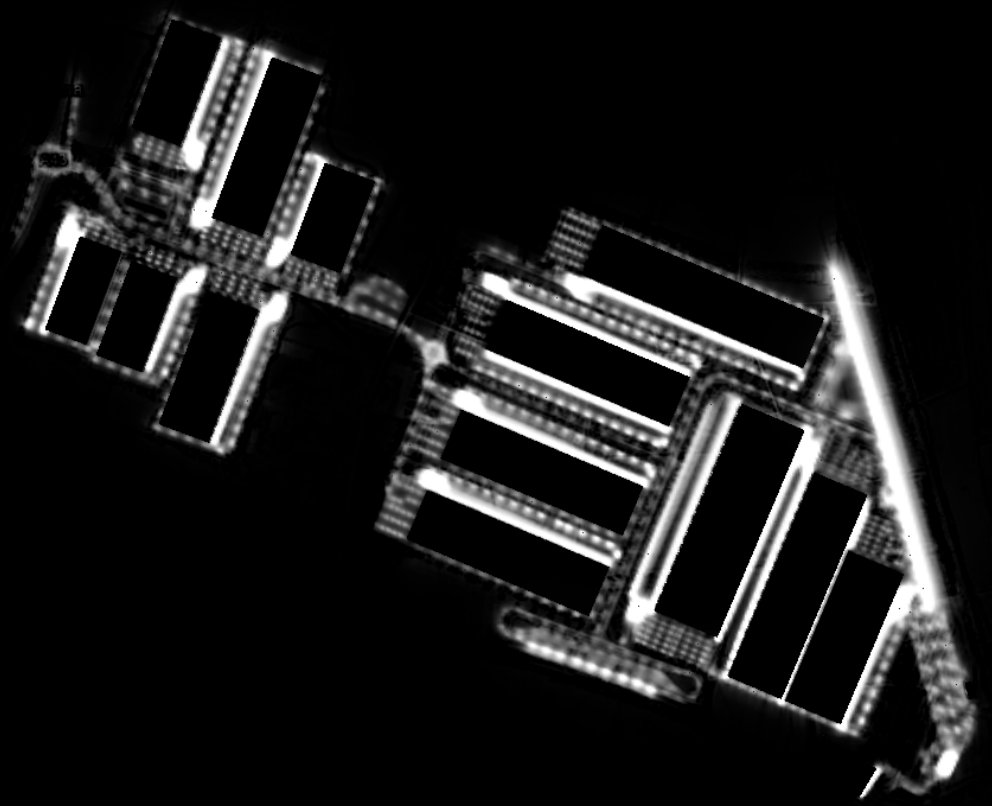


Figure 1.2 – Indicative External Lighting Parameters – Rendered Overview

1.0 External Lighting Parameters

External Lighting Parameters – Illuminance Overview

Below illustrates an illuminance overview of the operational lighting for assessment, this is based on the lighting equipment and criteria contained within the previous pages.

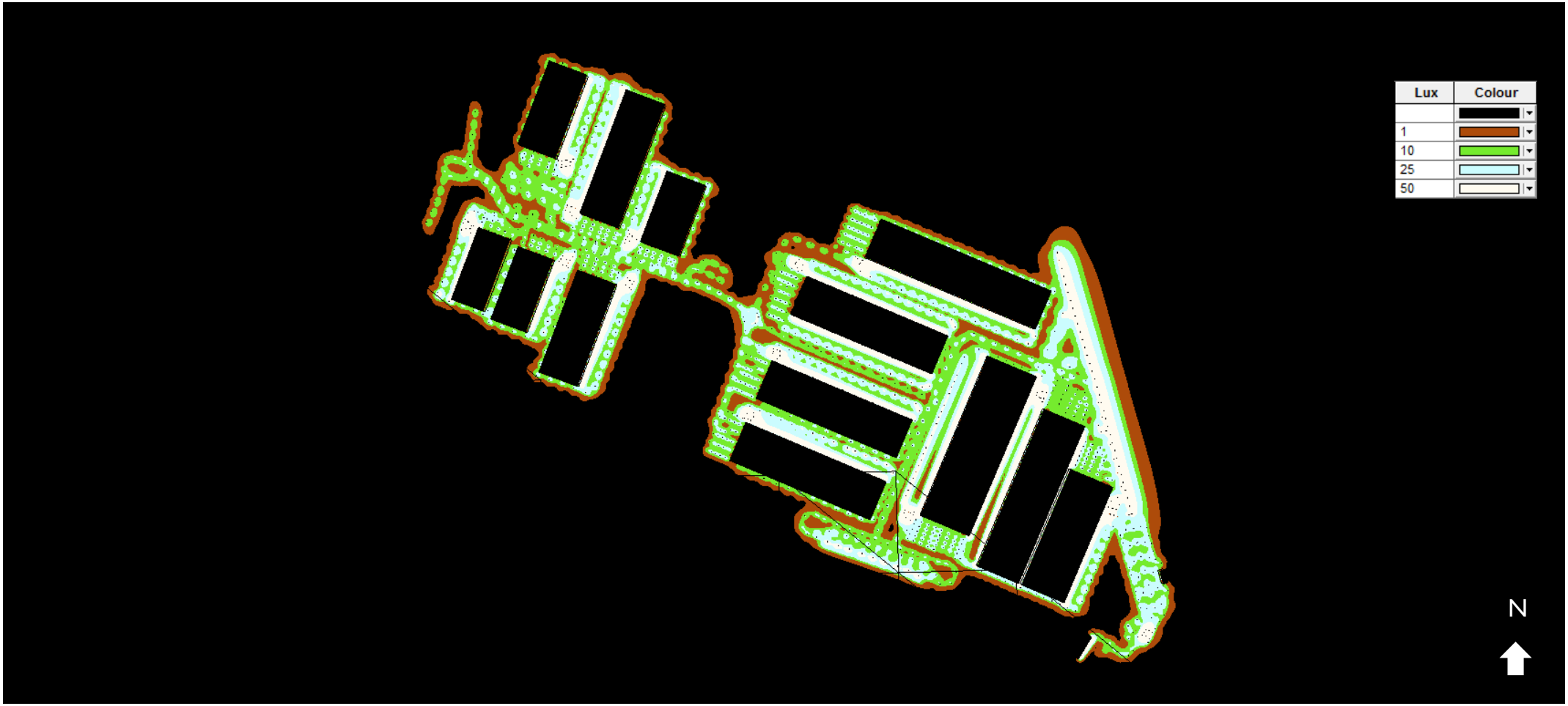


Figure 1.3 – External Lighting Parameters – Design Illuminance Overview

MF = Varying
Excludes all landscape bunding, fencing and planting (proposed / existing)

2.0 Lighting Design Development and Mitigation

Lighting Design Development

The detailed lighting design should consider best practice standards and technology, as appropriate. The external lighting specification(s) and design(s) for the proposed development of the Main SRFI site should be prepared by a specialist lighting engineer with due regard to the sensitivities of surrounding receptors. The lighting specification should include the appropriate selection of column heights, light fittings and luminaire design to ensure that the intensity and direction of the lighting is controlled through retaining tilting angles close to the horizontal to ensure that the effects of light spill, glare and sky glow are minimised. Consideration should be given, where applicable, to the measures in appropriate best practice guidance and standards.

Where applicable all lighting should be designed to comply with relevant codes and guidance, as follows:

- BS5489-1: 2013 – Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas
- BS EN 13201-2: 2015 – Road lighting – Part 2: Performance requirements
- BS EN 12464-2: 2014 – Lighting of Work Places – Part 2: Outdoor work places
- SLL– Lighting Guide 06 - The Exterior Environment – 2016
- SLL– Lighting Guide 01 – Industrial Environment - 2012
- SLL Guide to Limiting Obtrusive Light – 2012
- ILP – Guidance Notes for the Reduction of Obtrusive Light GN01: 2011
- Bat Conservation Trust (BCT) and Institute of Lighting Professionals guidance ('Bats and Lighting in the UK') + BCT Interim Guidance 2014

As a detailed lighting design is not available at this stage, for the purposes of assessment an indicative external lighting strategy has been developed. The following pages provide the lighting strategy and intent for the types of lighting within the areas identified.

Embedded Measures

Standard industry design measures have been embedded within the assessment design process and should be implemented within the detailed design, these include:

- Wherever possible, ensuring the use of controlled light distribution, optimised optics (flat glass - controlled light distribution below the horizontal) and considered luminaire positioning / minimal heights and tilting angles are employed;
- Luminaire selection based on inherent glare control to an appropriate G class ranging between 4 and 6;
- Modern, LED luminaires employed throughout the PDA to minimise the obtrusive light spill footprint and be as energy efficient as possible;
- All luminaires used around the perimeter of the PDA are mounted within the site, so that the main photometric distribution of the luminaire will be towards the task area, keeping all light within the boundary of the development and preventing artificial light spilling outside of this; and
- Wherever possible, adopting a light quality that minimises disruption to existing ecological systems in the form of 'LED' light sources (<4200K) which emit minimal UV and blue light.
- Columns are placed as far away as practicable from a rail bridge or the fence line of railway track; and
- Use of warm / neutral white light avoids conflict with rail signal lights being green, yellow and red).

2.0 Lighting Design Development and Mitigation

Operational / Design Mitigation Measures

The following operational and design mitigation measures are recommended to limit potential impact to all receptor locations and, where appropriate, should be incorporated into the detailed lighting design / installation where applicable:

- Detailed design to ensure the use of controlled light distribution, optimised optics (flat glass - controlled light distribution below the horizontal) and considered luminaire positioning are employed;
- Subject to masterplan development the location of the most onerous artificial lighting elements to be located away from the perimeter of the PDA with luminaires directed toward the centre of the PDA;
- All luminaires used around the perimeter of the PDA should be mounted within the PDA, so that the main photometric distribution of the luminaire will be towards the task area, keeping all light within the boundary of the PDA;
- To minimise potential obtrusive light trespass, glare and visual effect it is recommended that minimal column heights are considered in all applicable locations;
- Modern, LED luminaires should be employed to minimise the obtrusive light spill footprint and be as energy efficient as possible;
- Operational light levels to be designed to a minimum required for H&S and not to over light. This is to be achieved by employing a colour rendering of Ra > 60 and an S/P ratio > 1.2;
- To minimise disruption to bats, light sources utilised should employ lamps with minimal or zero ultra violet (UV) emission (insects are attracted to UV). Hence, it may be applicable to consider LED light sources (which have limited / zero UV content) rather than ceramic metal halide and other 'white light' discharge lamps. Recent BCT Interim guidance 2014 states that LED with a CCT of lower than 4200K should be used;
- Adopting an appropriate control strategy for the operational lighting so that, when not required and subject to Health and Safety assessment, non-essential lighting is switched off or , wherever possible, dimmed at a pre-determined curfew time (suggested as 23:00 in accordance with ILP Guidance Notes);
- It is not advised that movement detectors are used as a control of operation as this often causes greater adverse visual effect (on / off / on patterns) due to ecology and other external factors affecting the sensors. Control of operation for future development should be based on automated methodologies set out within the design process;
- Where applicable, glare controlling louvres and light shields to be applied post installation;
- Column and luminaires to be of a colour and finish to 'blend' in to the day time landscape view;
- The retention of existing and new proposals for perimeter tree screening, subject to the masterplan development.

3.0 Lighting Strategy

Site Access road lighting (S3)

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS5489-1: 2013 – Code of practice for the design of road lighting. Lighting of roads and public amenity areas
- BS EN 13201-2: 2015 – Road lighting – Part 2: Performance requirements

It is intended to illuminate internal access roadways within the Site as an S3 classification, this is comparable to the existing roadway through the Application Site.

An S3 classification requires an average illuminance of 6.3 Lux (minimum maintained) and a minimum of 1.3 Lux (maintained).

Based on Ra>60, S/P ratio = 1.2

15,000 lumen 4000k LED
Roadway Lantern, flat glass, 8-10m high

e.g. - Philips Luma R5

ULOR = Zero; Tilt = Zero

Control: Dusk to dawn photocell operation

Main Access road lighting (ME4a)

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS5489-1: 2013 – Code of practice for the design of road lighting. Lighting of roads and public amenity areas
- BS EN 13201-2: 2015 – Road lighting – Part 2: Performance requirements

It is intended to illuminate the main access roadway within the Site as an ME4a classification, this is comparable to the existing roadway through the Application Site.

An ME4a classification requires a minimum maintained luminance of 0.75cd/m^2 and a uniformity 40%.

23,000 lumen 4000k LED
Roadway Lantern, flat glass, 8-10m high

e.g. – Philips Luma R5

ULOR = Zero; Tilt = Zero

Control: Dusk to dawn photocell operation

3.0 Lighting Strategy

Roundabout lighting (CE3)

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact
- Luminaire arrangement based on minimising shadows between vehicles
- Minimal tilt angle

Typical Design Criteria

- BS5489-1: 2013 – Code of practice for the design of road lighting. Lighting of roads and public amenity areas
- BS EN 13201-2: 2015 – Road lighting – Part 2: Performance requirements

Lighting class: CE3 - Mixed vehicle and pedestrian with separate footways.

The CE classes in are intended for drivers of motorized vehicles, and other road users, on conflict areas such as shopping streets, road intersections of some complexity, roundabouts, queuing areas etc.

Average maintained Illuminance – 15 Lux

Uniformity – 40%

23,000 lumen 4000k LED
Roadway Lantern, flat glass, 10m high

e.g. – Philips Luma R5

ULOR = Zero; Tilt = Zero.

Control: Dusk to dawn photocell operation

3.0 Lighting Strategy

HGV Parking Lighting

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact
- Minimal tilt angle

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places

Medium traffic

Parking spaces of department stores, office buildings, plants, sports and multipurpose building complexes

Average maintained Illuminance – 10 Lux

Uniformity – 25%

19,000 lumen 4000k LED
Roadway Lantern, flat glass, 12m high

e.g. – Philips Luma R6

ULOR = Zero; Tilt = Zero

Car Park Lighting

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places

Medium traffic

Parking spaces of department stores, office buildings, plants, sports and multipurpose building complexes

Average maintained Illuminance – 10 Lux

Uniformity – 25%

5,000 lumen 4000k LED
Roadway Lantern, flat glass, 5m high

e.g. – Philips Mini Luma R5

ULOR = Zero; Tilt = Zero

Control: Dusk to dawn photocell operation

3.0 Lighting Strategy

Service Yards

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places
- Industrial sites and storage areas
- Short-term handling of large units and raw materials, loading and unloading of solid bulk goods

Average maintained Illuminance – 20 Lux

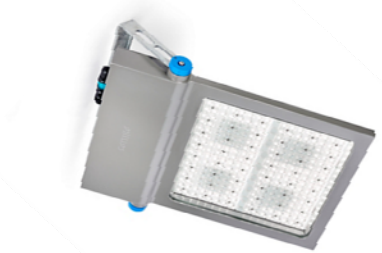
Uniformity – 25%

38,000 lumen 4000k LED
Roadway Lantern, flat glass, 10m high

e.g. – Philips Luma R6

ULOR = Zero; Tilt = Zero.

Control: Dusk to dawn photocell operation



65,000 lumen 4000k LED
Building Mounted floodlight, flat glass, 10m high

e.g. – Philips Clearflood A60 optic

ULOR = Zero; Tilt = Zero.

Control: Dusk to dawn photocell operation

Loading/Unloading Bays

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places
- Industrial sites and storage areas
- Continuous handling of large units and raw materials, loading and unloading of freight, lifting and descending location for cranes, open loading platforms.

Average maintained Illuminance – 50 Lux

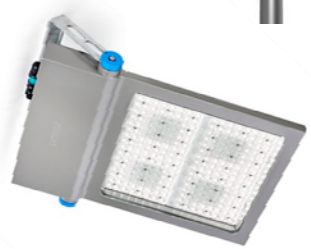
Uniformity – 40%

38,000 lumen 4000k LED
Roadway Lantern, flat glass, 10m high

e.g. – Philips Luma R6

ULOR = Zero; Tilt = Zero.

Control: Dusk to dawn photocell operation



65,000 lumen 4000k LED
Building Mounted floodlight, flat glass, 10m high

e.g. – Philips Clearflood A60 optic

ULOR = Zero; Tilt = Zero

Control: Dusk to dawn photocell operation

3.0 Lighting Strategy

Checkpoints

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places
- Industrial sites and storage areas
- Short-term handling of large units and raw materials, loading and unloading of solid bulk goods

Average maintained Illuminance – 150 Lux

Uniformity – 40%

34,000 lumen 4000k LED
Roadway Lantern, flat glass, 10m high

e.g. – Philips Luma R4

ULOR = Zero; Tilt = Zero.

Control: Dusk to dawn photocell operation

Barrier

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places
- Industrial sites and storage areas
- Continuous handling of large units and raw materials, loading and unloading of freight, lifting and descending location for cranes, open loading platforms.

Average maintained Illuminance – 50 Lux

Uniformity – 40%

34,000 lumen 4000k LED
Roadway Lantern, flat glass, 10m high

e.g. – Philips Luma R4

ULOR = Zero; Tilt = Zero.

Control: Dusk to dawn photocell operation

3.0 Lighting Strategy

Weighbridge (where applicable)

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places
- Industrial sites and storage areas

Average maintained Illuminance – 20 Lux

Uniformity – 40%

15,000 lumen 4000k LED
Roadway Lantern, flat glass, 10m high

e.g. – Philips Luma R5

ULOR = Zero; Tilt = Zero.

Control: Dusk to dawn photocell operation

Wheelwash (where applicable)

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places
- Industrial sites and storage areas

Average maintained Illuminance – 20 Lux

Uniformity – 40%

15,00 lumen 4000k LED
Roadway Lantern, flat glass, 10m high

e.g. – Philips Luma R5

ULOR = Zero; Tilt = Zero

Control: Dusk to dawn photocell operation

3.0 Lighting Strategy

Intermodal Terminal

Typical Equipment

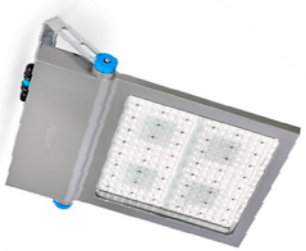
- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact
- Localised task lighting as required; e.g. Intermodal Cranes

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places
- Industrial sites and storage areas
- Continuous handling of large units and raw materials, loading and unloading of freight, lifting and descending location for cranes, open loading platforms.

Average maintained Illuminance – 50 Lux

Uniformity – 40%



65,000 lumen 4000k LED
Floodlight, flat glass, 18 - 20m high

e.g. – Philips Clearflood A60 optic

ULOR = Zero; Tilt = Zero.

Control: Dusk to dawn photocell operation

Express Freight Cross-Dock platform

Typical Equipment

- LED sources to minimise disruption to wildlife (min. UV light spectrum CCT<4200k)
- Controlled light distribution minimises obtrusive light, flat glass optic
- Column heights at minimum to reduce obtrusive light and visual impact

Typical Design Criteria

- BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places
- Industrial sites and storage areas
- Continuous handling of large units and raw materials, loading and unloading of freight, lifting and descending location for cranes, open loading platforms.

Average maintained Illuminance – 50 Lux

Uniformity – 40%

19,000 lumen 4000k LED
Roadway Lantern, flat glass, 12m high

e.g. – Philips Mini Luma R6

ULOR = Zero; Tilt = Zero

Control: Dusk to dawn photocell operation

4.0 Lighting Guidance

Lighting Guidance for Future Lighting to the Application Site

Lighting guidance provides a basis for the typical lighting arrangements illustrated for the proposed uses of the Application Site.

As follows:

Future Lighting

The operational lighting for the Application Site should be based on the use of current lighting technologies and innovative design to optimise visual acuity, energy efficiency, safety, security and light pollution control.

Design criteria should be based on current lighting standards and guidance for minimising the effect of obtrusive light.

All non-essential lighting should be turned off or dimmed when not required and subject to Health and Safety assessment.

The detailed lighting design(s) should consider best practice standards and technology, as appropriate, and be agreed with the local authority. The external lighting specification(s) and design(s) for the proposed development of the Site should be prepared by a specialist lighting engineer with due regard to the sensitivities of surrounding receptors. The lighting specification should include the appropriate selection of column heights, light fittings and luminaire design to ensure that the intensity and direction of the lighting is controlled through retaining tilting angles close to the horizontal to ensure that the effects of light spill, glare and sky glow are minimised. Consideration should be given, where applicable, to the measures in appropriate best practice guidance and standards.

All lighting should be designed to comply with relevant codes and guidance.

The following needs to be considered during design and installation:

- All electrical wiring must conform to IEE code of practice and to any local authority requirements;
- The height and style of the lighting columns needs to be in keeping with the surrounding;
- Lighting columns positioned correctly not only to ensure that correct lighting levels are provided but also to ensure that they do not hinder any access or restrict movement to disabled residents (wheel chair). It is also important to ensure that lighting columns are not positioned in vulnerable locations where they may get damaged by vehicular traffic;
- Lighting columns and luminaire positioning should be installed in accordance with manufacturers and professional structural guidance with respect to structural loads, windage and safe access for maintenance;
- Lighting columns planted in accordance to the manufacturers instructions and at the correct depth;
- Light pollution has been controlled by using appropriate light fittings and also by correct positioning of lighting columns.

Audit Sheet

Rev.	Description	Prepared and checked by	Reviewed by	Date
P1	IIP - Draft Issue Review	CC	LG	17.11.16
P2	Post review issue	LG	CC	22.11.16
P3	Draft Issue	LG	CC	07.12.16
P4	Amended to Illustrative Masterplan	LG	CC	11.05.17
P5	General Amendments for 2nd Draft	CC	DDM	07.07.17
P6	Final Issue	DDM	DDM	01.03.18

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