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Client

Davies Homes Ltd

Report

Street lighting design at Dragon Park, Merthyr Tydfil

Rev

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Author of this Report

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Contents

This report comprises two parts.

The first part, this Word document, is a description of the lighting scheme. It considers issues such as ecology, light spill, conformance to standards, assumptions made, mitigation measures, description of the equipment used etc.

It also shows the approximate positions of all the luminaires.

The second part is the detailed lighting layout showing the position of each luminaire. It also shows isolux contour lines (the spread of illumination) down to 0.5 lux.

This part is a large file (approx. 3Mb) and is attached as a separate PDF.

Summary of the lighting design and ecological impact

The new Section 38 areas of the site are illuminated to an average of 5 lux. This is classified as P4 in BS 5489. The riverside path is also illuminated to P4. It could be dimmed further.

The existing southern entrance road to the site is illuminated to 7.5 lux, P3, since this will receive the highest traffic flow.

Generally, 6m columns are used throughout except for some 8m on the southern roundabout. The riverside path uses 1m high bollards.

We have used Warm, 3000K LEDs throughout. Note that the bollards are available in 2700K and an Amber 1750K.

The SUDS pond to the south receives very little light, most is below 0.5 lux, but we recommend that rear visors are fitted to the streetlighting lanterns on the nearby roads.

The Riverside footpath lighting is illuminated using bollards and the illumination drops to below 0.5 lux within approximately 4m of the path edge.

Detailed calculations showing the extent of the illumination down to 0.5 lux (the level recommended by the Bat Conservation Trust) are shown in the attachment.

The streetlights emit zero upward light. The bollards emit less than 2.5% upwards; this is within the recommended upper limit for a location such as this.

Background and site location

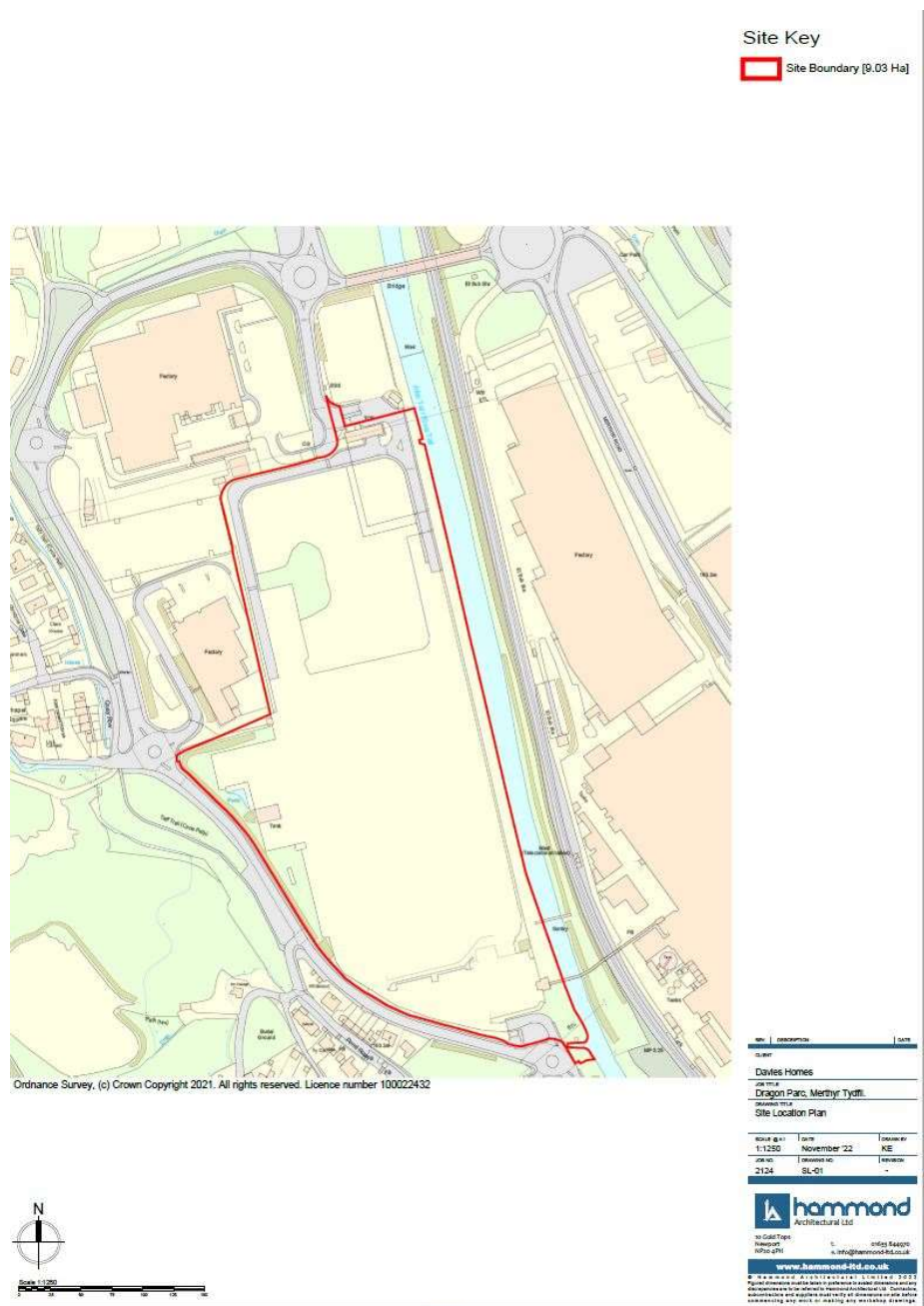
Davies Homes Ltd are proposing to build a residential development of 200 homes on land adjacent to the River Taff, Merthyr Tydfil. The site is currently disused industrial land situated between the river and the A470 dual-carriageway.

Whilst the area is predominantly industrial, bat activity has been recorded on the site. As such, Natural Resources Wales, has asked for full details of a Lighting Plan. This will include the siting and type of all external lighting. It should also include drawings setting out the light spillage in key sensitive areas, in particular the River Taff corridor, all retained vegetation surrounding the site, and the proposed new SUDS pond to the south.

Alan Tulla Lighting is an independent lighting consultancy specialising in the exterior environment and has been asked to provide such a design.

Location

The proposed development runs alongside the river Taff on the opposite side to the Hoover Factory.



Merthyr Tydfil Council advise us that this location is considered to be an E3 Environmental Zone and our design and report are based on this classification. Other Environmental Zones are described below:

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

Table taken from ILP Guidance Note, GN01/2021

Environmental considerations

A residential development such as this will require some form of road and outdoor lighting for the safe movement of residents and visitors. Lighting will be required for the main distributor roads and might also be required for the cul-de-sacs, shared surfaces and footpaths.

The Alder Ecology report of November 2022 confirms that this is an E3 zone and that the main bat foraging routes are north/south along the boundaries. There is also some movement E/W.

Note that the Landscape, Biodiversity and Amenity strategy by Catherine Etchell Associates recommends that the N/S footpath along the eastern boundary, between the housing and the river Taff, should have low level or no lighting along the footpath.

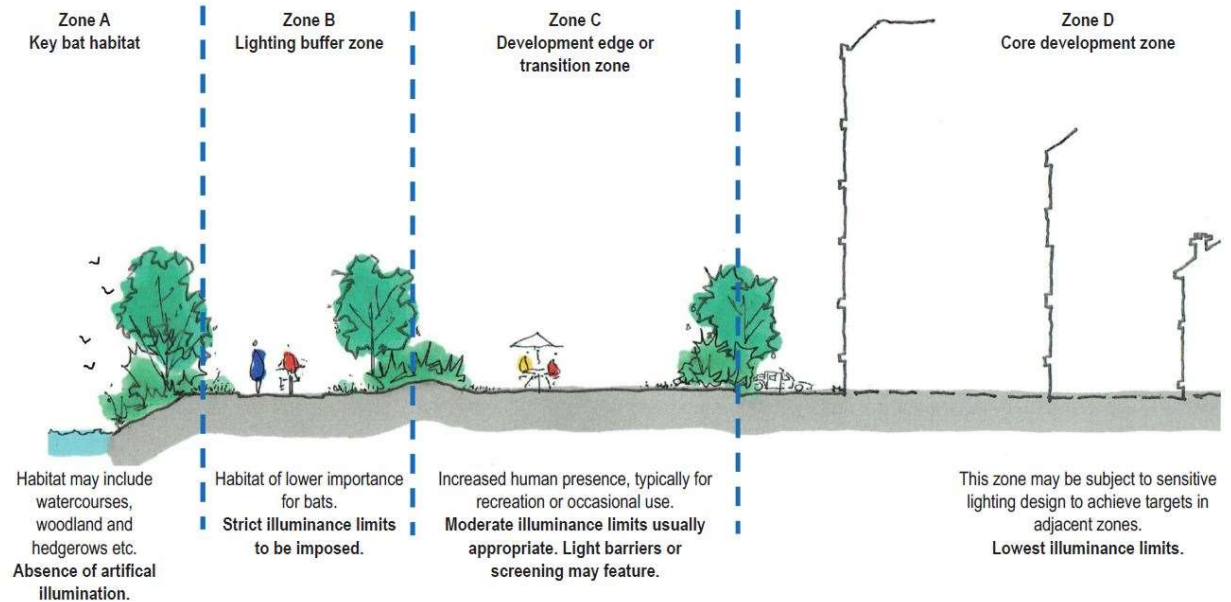
The Bat Conservation Trust document “Bats and Lighting in the UK” 2018 recommends no more than 0.5 lux along foraging routes. In this case, this would apply to the river corridor. Our calculations show the 0.5 lux contour line and its relation to the Taff.

Again, the BCT document recommends LED light sources with a colour temperature, CCT, of Warm White, preferably 2700K although 3000K is acceptable. This lighting design uses Warm, 3000K LEDs throughout but note that the bollards are available in 2700K and an Amber 1750K.

Lighting buffer zones to minimise impact on bats.

Extract from the Bat Conservation Trust document “Bats and Lighting in the UK” 2018.

Example of illuminance limit zonation



Riverside path

This is the winding pedestrian route situated between the housing and the river Taff. The path is illuminated with bollards. Since the path bends, the distance of the bollards from the Taff will vary. For this reason, the 0.5 lux contour will, thus, also vary. However, for almost all its length, the 0.5 lux level is achieved within 4m of the path. I.e. the illumination level drops to below 0.5 lux beyond 4m from the edge of the path. The cyan line below shows the region between 1.0 lux and 0.5 lux. Areas to the right of this line receive less than 0.5 lux. The contour is wider nearer the roundabout because that area is illuminated using 6m columns. The bollard has an internal switch which can reduce the output (and hence illumination) by half.



Typical section of path with bollard lighting



Lighting design criteria

We are advised by the Council to use 6m columns. The Council has also specified the type of streetlighting lantern to be used the TRT Mini Aspect.

We assume from the BS 5489 Table below that being in an E3 environmental zone that the internal roads would have a P4 classification (average of 5 lux with a minimum of 1.0 lux).

Note that the entrance road to the site from the roundabout is illuminated to P3 classification (average of 7.5 lux with a minimum of 1.5 lux). This is because it will receive more traffic than the inner roads.

LIGHTING CLASSES FOR SUBSIDIARY ROADS BS5489-1: 2020 TABLE A.5

TRAFFIC FLOW	LIGHTING CLASS		
	E1 TO E4 ^{A)}	E1 TO E2 ^{A)}	E3 TO E4 ^{A)}
	PEDESTRIAN AND CYCLISTS ONLY	SPEED LIMIT $\leq$ 30MPH	SPEED LIMIT $\leq$ 30MPH
BUSY ^{B)}	P5	P4	P3
NORMAL ^{C)}	P5	P5	P4
QUIET ^{D)}	P6	P5	P4

The streetlighting lanterns are a “flat glass” type which emit no upward light. Bollards and external house lights should emit no more than 2.5% upward light.

Equipment used



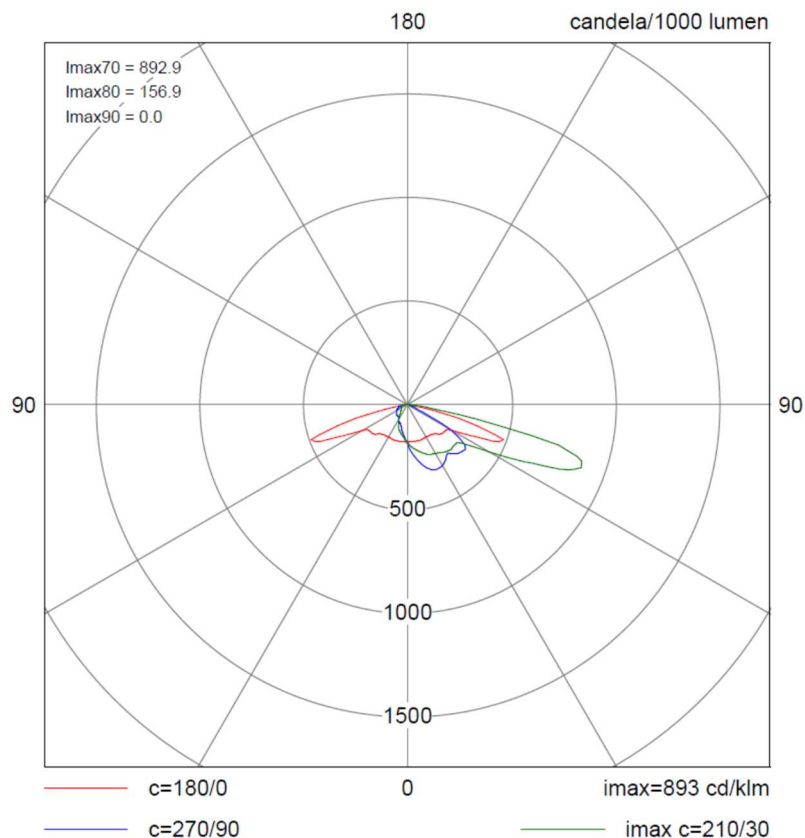
ASPECT MINI

PowerSet

- | | |
|--|--|
|  IP66 Ingress Protection |  I Electrical Class |
|  IK10 Body / IK08 Lens |  -20°C Minimum Ambient |
|  4.2kg Weight |  45°C Maximum Ambient |
|  0.0352m² Wind Area |  LED Light Source |

Various versions are used from 19W to 50W with light output of 1,800 – 4,900 lm. All are 3000K on 6m columns.

Luminaire C ASM4 LED 19W GR2 3000K EXP



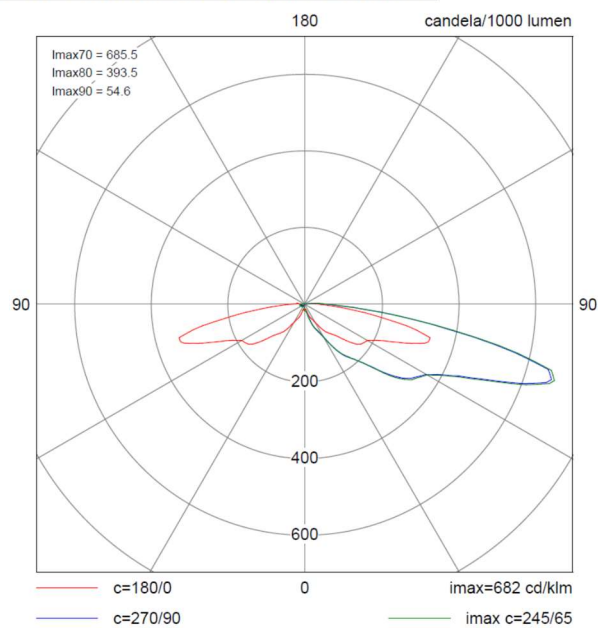
Several different types of optic are used and this shown is the most typical.

-  IP66 Ingress Protection
-  IK10 Impact Resistance
-  10.5kg Weight
-  Electrical Class I
-  -20 to +45°C Ambient



This bollard is used along the Riverside path. Version used is 10W, has an asymmetric light distribution, 3000K with 500 lm output. 2700K and Amber 1750K are options.

Luminaire F VIA ASY 330mA PowerSet/OptiSet 3000K LED



Lighting mitigation measures

The actual dimming and/or switching regime should be discussed Merthyr Tydfil Council at the detailed design stage. A typical regime is suggested below:

Peak time, dusk to 20.00 hrs – 100% light output.

20.00 to midnight – 50% output.

Midnight to sunrise – switch off.

Note that actual hours of operation will depend on the season.

15

Glossary of Lighting Terms

Illuminance: this is the SI term for what is normally referred to as Illumination level. It is measured in lux. It refers to the light falling on a surface. Normally this is a horizontal plane such as the ground or desktop. It can also refer to vertical surfaces such as windows and building facades. Illuminance is measured in lux.

Lumen: is the SI term for luminous flux or quantity of light. A typical 8w LED “bulb” emits 700 lumens; a 1.5m fluorescent tube emits around 5,500 lm.

Lux: is defined as an illuminance of 1 lumen/m². A residential road is typically 3 – 10 lux, a major traffic route 20 – 30 lux. A typical tennis court would be 300 -500 lux. Note that lux is normally taken to be the horizontal value but the vertical value is often relevant. E.g. vertical illuminance is important in recognising faces or light intrusion on windows.

Luminance: It is a measure of objective brightness and is a function of how much light is reflected off a surface. There are many factors involved but the major one is the reflectance of the surface. For a given level of illuminance, dark surfaces have lower luminance than light coloured surfaces. Its importance is that it is the metric used for classifying traffic routes, signs and advertising hoardings.

Luminaire: is the term for what is usually referred to as a light fitting. A fixture, light fitting or lantern are other commonly used terms. These terms are used to distinguish them from the actual light source or lamp.