BRYMBO IRON AND STEELWORKS, HERITAGE CENTRE

LIGHTING PLAN REVIEW

DATE	ECOLOGIST	APPROVED	VERSION	COMMENTS
12/04/2024	Richard Cutts	Rhian Hughes	V1	

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Report Ref EE.672.24e.RC

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Contents

1.0 Introduction 3
2.0 Bats and Artificial Lighting 4
3.0 Site Details and Results of Ecological Surveys 7
4.0 Lighting Plan 10
5.0 Ecological Impacts 12
6.0 Ecological Compliance Audit and KPIs 15
7.0 References 16

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1.0 Introduction

1.1 Enfys Ecology Limited were commissioned by TACP Architects on behalf of Brymbo Heritage Trust to review the lighting plan with regards to works in the Brymbo Heritage Area (Wrexham County Council planning application P/2023/0674). Enfys Ecology have previously carried out ecological surveys of Brymbo Heritage Area, including a Preliminary Ecological Appraisal (Cutts, 2022) and bat/nesting bird surveys (Hughes, 2020; Cutts, 2023).

1.2 The proposed works involve repairs and refurbishments to several buildings and structures within the steelworks area of the site, some of which be used as visitor and volunteer facilities. This includes the installation of new permanent external lighting in parts of the site.

1.3 Artificial lighting can adversely impact bats, other nocturnal animals, and nesting birds. Lighting design should therefore take these impacts into account, and seek to minimise disturbance to protected species.

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2.0 Bats and Artificial Lighting

2.1 The Institution of Lighting Professionals (2023) conclude that for bats, artificial lighting at night (ALAN) is thought to increase the chances of predation by avian predators (such as owls and hawks) and in lit areas, bats are known to modify their behaviour, potentially in response to this threat. Illuminating a bat roost can cause disturbance and this may result in the bats deserting the roost, or even becoming entombed within it. Lighting would therefore be considered an obstruction under the legislation protecting bats and their roosts. In addition, artificial lighting can also affect the feeding behaviour of bats.

2.2 Key messages from the ILP (2023) 'Bats and Artificial Lighting at Night' guidance include:

- The ecological mitigation hierarchy applies to lighting design: impacts to biodiversity should be avoided in the first instance through design and where this has been clearly demonstrated not to be possible, appropriate mitigation needs to be put in place. Compensation is the least desirable option, so all other avenues should first be explored and ruled out. In parallel, opportunities to design lighting betterment for biodiversity should be sought wherever possible.

- It is important to integrate avoidance measures into developmental design, by retaining ecologically functional 'dark corridors' within schemes wherever feasible, and in preference to seeking lighting mitigation strategies. Consideration should be given to the lighting effect of a scheme on Key Habitat and Supporting Habitat areas for bats, as well as commuting routes.

- It is important to minimise Artificial Lighting At Night (ALAN) close to vegetation, particularly for slower-flying bat species.

- ALAN has been shown to be particularly harmful along river corridors, near woodland edges and hedgerows.

- Bats have considerable sensitivity to very low light levels and distances from light sources, and there is a need to maintain or reduce existing light levels in the environment.

- Careful choices would need to be made about the type of lighting chosen for a scheme, and this should be designed through a multi-disciplinary design approach. Whilst Part Night Lighting (PNL) schemes and the installation of LED lights may have energy-saving benefits, they can result in an increase in light intensity, impacting on bat behaviours, and the lighting design for each site should be developed using information from bat surveys, and pre-development light level data.

2.3 Slower-flying, broad-winged species (such as long-eared, *Myotis* species (which include Brandt's, whiskered, Daubenton's, Natterer's and Bechstein's), barbastelle and greater and lesser horseshoe) have been shown to avoid commuting and foraging routes illuminated

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with a variety of different street luminaires. Consequently, these bat species are put at a competitive disadvantage and are less able to forage successfully and efficiently, and ILP (2023) suggest that Artificial Lighting At Night (ALAN) has potentially devastating conservation consequences for these species.

2.4 Faster-flying species (such as noctule, Leisler's, serotine and pipistrelle) can congregate around white light sources, particularly those on the UV spectrum (ILP, 2023). This is because their prey are attracted to the light source and the feeding opportunities for these bats are then concentrated into a smaller area around the light. ILP (2023) conclude that the cumulative impacts from Artificial Lighting At Night (ALAN) on these bat species are likely to have negative impacts on the Favourable Conservation Status of a bat species.

2.5 In terms of commuting through the landscape, and in towns and cities, bats will, in general, avoid heavily lit areas, which can be a barrier to bat commuting, with bats altering their commuting routes to avoid light areas.

2.6 After avoiding, wherever possible, the potential impacts of Artificial Lighting At Night (ALAN) through scheme designs, if further mitigation measures are required in the form of lighting controls, ILP (2023) recommend that a lighting professional helps to select those light sources, lamps, LEDs and their fittings which are most appropriate for the project. To assist with the decision-making process, ILP (2023) suggest that the following are considered when choosing luminaires:

- All luminaires should lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- LED luminaires should be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability.
- A warm white light source (2700Kelvin or lower) should be adopted to reduce blue light component.
- Light sources should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats (Stone *et al*., 2012).
- Internal luminaires can be recessed (as opposed to using a pendant fitting) where installed in proximity to windows to reduce glare and light spill.
- Waymarking inground markers (low output with cowls or similar to minimise upward light spill) to delineate path edges.
- Column heights should be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.

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- Only luminaires with a negligible or zero Upward Light Ratio, and with good optical control, should be considered - see ILP (2021) GN01.

- Luminaires should always be mounted horizontally, with no light output above 90° and/or no upward tilt.

- Where appropriate, external security lighting should be set on motion sensors and set to as short a possible a timer as the risk assessment will allow. For most general residential purposes, a 1 or 2 minute timer is likely to be appropriate.

- The use of bollard or low-level downward-directional luminaires is strongly discouraged. This is due to a considerable range of issues, such as unacceptable glare, poor illumination efficiency, unacceptable upward light output, increased upward light scatter from surfaces and poor facial recognition which makes them unsuitable for most sites. Therefore, they should only be considered in specific cases where the lighting professional and project manager are able to resolve these issues.

- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed. However, due to the lensing and fine cut-off control of the beam inherent in modern LED luminaires, the effect of cowls and baffles is often far less than anticipated and so should not be relied upon solely.

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3.0 Site Details and Results of Ecological Surveys

3.1 The site has previously been visited by Enfys Ecology for various ecological surveys. The latest site visit was carried out by Richard Cutts from Enfys Ecology on 8th March 2024, undertaking an ecological survey of the proposed car park (immediately east of the steelworks area) and checks of the on-site amphibian exclusion fencing.

3.2 *Site Description*

3.2.1 The development area is centred on the former steelworks area of the Brymbo Heritage Area, which is predominantly hardstanding and ephemeral/short perennial habitat, and includes several industrial buildings in various states of repair (Figure 3.1). The wider Brymbo Heritage Area extends to the west of the steelworks, and to the south to Brymbo Fossil Forest area.

The site is located in a rural area on the southern outskirts of Brymbo village (Figure 3.2). To the south and west of the site is a large area of fields bounded by scattered trees and hedges. Part of the former steelworks lies to the east of the survey area, beyond a trunk road, and consists of a mixture of bare ground with patchy vegetation, semi-improved grassland and scattered scrub.

3.2.2 Key buildings and features referred to in this report are shown in Figure 3.3.



Figure 3.1: Site location – the approximate site boundary is shown in red.
Background image ©Google Maps 2024

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FIGURE 3.2: WIDER SITE LOCATION – THE APPROXIMATE SITE BOUNDARY IS SHOWN BY THE RED STAR.
BACKGROUND IMAGE ©GOOGLE MAPS 2024

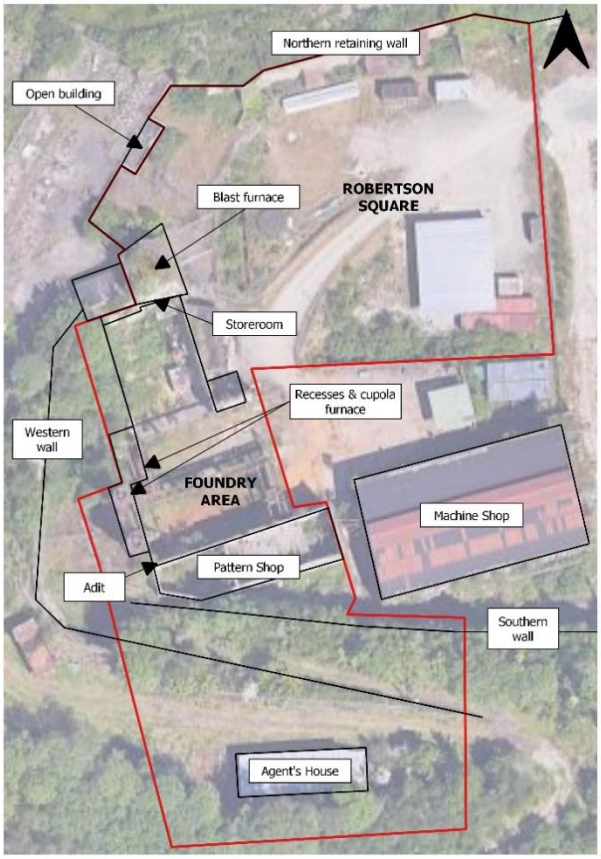


FIGURE 3.3: BUILDINGS AND FEATURES IN THE STEELWORKS AREA AT BRYMBO HERITAGE AREA.
BACKGROUND IMAGE ©GOOGLE MAPS 2024

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3.3 *Habitats and Species*

3.3.1 The habitats within the steelworks area generally offer limited foraging opportunities for bats. However, woodland to the south and west would provide good foraging habitat for bats and other nocturnal species; some of the woodland (in the vicinity of the Agent's House, to the south of the Foundry Area) falls within the development area for this planning application but will be retained.

3.3.2 Previous ecological surveys (Cutts, 2023) identified many features which could potentially be used by roosting bats, and the following bat roosts have been observed within the Foundry Area (also see Figure 5.1; the numbers below refer to locations on the map):

- Brown long-eared roost in the open building in the north-western corner of Robertson Square [1]
- Lesser horseshoe roost in the Blast Furnace [2]
- Lesser horseshoe roost in the store to the north of the Foundry Area [3]
- Lesser horseshoe roosts in recesses in the Foundry Area (western side) [4]
- Likely lesser horseshoe roost in the Mine Adit (NW corner of the Pattern Shop) [5]
- Likely common pipistrelle roost in the external south-western wall of the Foundry Area [6]
- Common pipistrelle roost in the north-western corner of the Agent's House [7]

3.3.3 Low levels of bat foraging activity – mainly common pipistrelle – have been recorded throughout the steelworks area, particularly in the south-western corner. In addition to the species listed above, *Myotis* bats (species not determined) have also been briefly recorded in the Foundry Area.

3.3.4 There are numerous opportunities for nesting birds both within/around the structures in the Foundry Area, and in the adjacent habitats, especially the woodland to the west and south. Birds have been reported or observed from the following places within the Foundry Area, which could potentially be nesting locations (also see Figure 5.1; the letters below refer to locations on the map):

- Barn owls and jackdaws in the northern retaining wall [A]
- Barn owl(s) in the open building in the north-western corner of Robertson Square [B]
- Barn owls in wall to the west of the Foundry Area [C]
- Bird nest (species not identified) in the Pattern Shop wall [D]
- Swallows previously reported nesting inside the Machine Shop [E]

3.3.5 Badgers have been observed within Brymbo Heritage Area, to the west of the Foundry Area. Although there are no known badger setts within the immediate vicinity of the development area, badgers likely forage in the woodland and adjacent habitats (and potentially the edges of the Foundry Area), may be affected by any light spill into these areas.

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4.0 Lighting Plan

4.1 The lighting plan for the works in the Foundry Area has been created by Carpenter Davies Partnership (2023). Modelled (horizontal) light levels for the proposed lighting plan has been provided to Enfys Ecology and is shown in Figure 4.1.

4.2 This plan is only for additional permanent additional on the site, and does not cover any temporary lighting (e.g. event lighting) that may be used on the site following completion of the works.

4.3 The lighting plan specifies the installation of eight external 'Opus Wallpack Dextra 0' luminaires, mounted with no tilt. The product specifications note a very low (less than 2.5%) upward light spill for this model of luminaire. The lights will be controlled by photocells and timers, with manual overrides.

4.4 The luminaires specified have a light flux of 2.00 klm and a colour of 4000K, and are all to be mounted at a height of two metres.

4.5 One additional external light (star on Figure 4.1) will be a non-maintained light for emergency use only.

4.6 New lighting will be installed inside the Pattern Shop and Machine Shop. Light spillage calculations for the internal lighting were not available at the time of this review.

4.6 There are no plans for additional lighting during the works.

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Figure 4.1: Locations of luminaires and modelled horizontal luminance (Lux) for the proposed lighting plan (position of additional emergency light shown by the yellow star).
Image © Carpenter Davies Partnership 2023

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5.0 Ecological Impacts

5.1 Figure 5.1 overlays the positions of known bat roosts and bird nests with the horizontal luminance plan; also illustrated are the main blocks of woodland/trees along the edges of the Foundry Area, and the focus of bat foraging activity (to the south-west of the Foundry Area) as observed during bat activity/emergence surveys (Cutts, 2023). Vertical light spillage will be very low due to the design of the selected luminaries.

5.2 As the luminaires are located around the northern, eastern and southern elevations of the Machine Shop and Pattern Shop, there will be no direct illumination of any known bat roosts or bird nests, with the possible exception of swallow nests in the Machine Shop (see Section 5.5, below). Modelled horizontal illuminance show that there will be no additional light spillage reaching these features.

5.3 The external light positioned on the south-western corner of the Pattern Shop will be set up for emergency use only; while there could be potential light spill from this luminaire into bat activity areas (including close to the entrance of bat roosts), it will not be used in conjunction with the general lighting.

5.4 Light levels will also be largely unchanged along the woodland edges adjacent to the Foundry Area, and in the south-west corner where the highest levels of bat foraging activity were observed. The lighting plan suggests some additional lighting of small parts of the woodland edge immediately south of the Machine Shop and Pattern Shop; however, the woodland sits on top of a high retaining wall and, as it is above the height of the external luminaires, is anticipated to receive minimal additional light spillage.

5.5 Light levels will be effectively unchanged along the western edge of the Foundry Area, where the majority of bat activity has been observed. Bat flight lines and foraging activity should therefore not be impacted by the proposed lighting.

5.6 Barn owl activity in the site, including likely nests, is largely restricted to the western and northern edges of the steelworks area, which will be unaffected by the proposed lighting.

5.7 Swift boxes have previously been installed on the northern wall of the Pattern Shop; it is not known if these are in use by swifts or any other birds. The boxes are positioned higher than the proposed luminaries and although there will be some upwards light spillage levels will be low and unlikely to have an impact on any birds using the boxes.

5.8 While the external lighting is expected to have little to no impact on bat and bird activity, it is still recommended that timers are used to maximise dark periods, as this will be beneficial for all nocturnal animals using the site.

5.9 The lighting plan has specified 4000K luminaires. ILP (2003) recommends using luminaries with a colour of 2500K or lower, as these have a lesser impact on bats and other nocturnal animals. While the lighting design as currently planned should not have a detrimental effect

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on any wildlife using the site, the use of a warmer light source (if possible) would be preferable.

5.10 It has not been possible to fully assess the impacts of proposed internal lighting for the Pattern Shop and Machine Shop. As there are no windows on the north side of the Pattern Shop, there will be no additional illumination of the bat roosts within the steelworks area as result of the internal lighting.

5.11 Some internal light spillage is anticipated from the other elevations of these buildings, and may further illuminate the trees to the south. Again, this impact could not be fully assessed, but is anticipated to be a lower level (although largely continuous along the edge of the buildings) than the light spillage from the proposed external lighting. It is understood that this lighting will not be in continuous use.

5.12 Swallows have previously been reported as nesting within the Machine Shop. As the current access points – if retained - are above the height of the external luminaires, but internal illumination could discourage swallows from nesting within the building. To compensate for this, swallow cups will be installed in other locations around the steelworks area.

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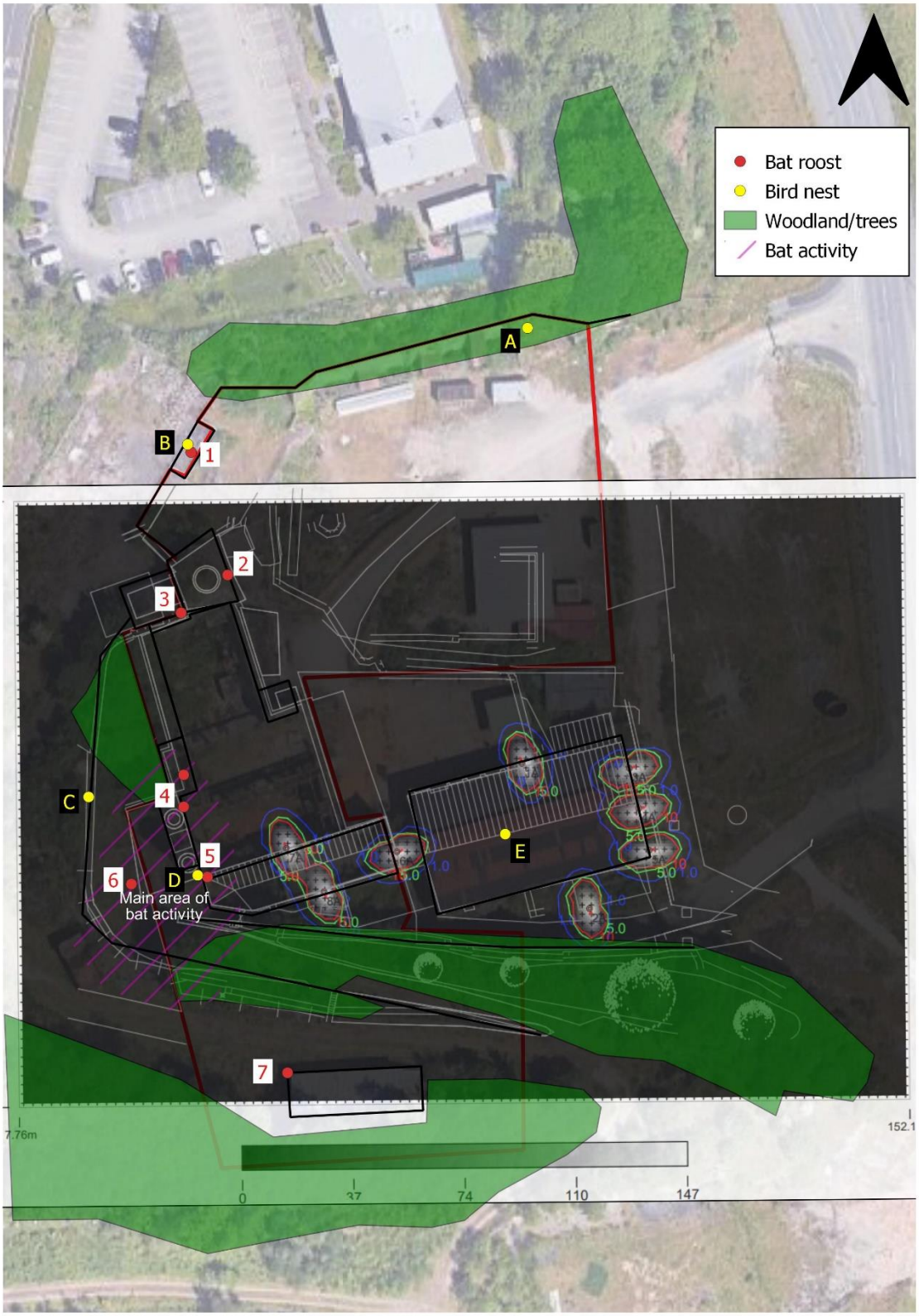


FIGURE 5.1: MODELLED HORIZONTAL LUMINANCE (LUX) FOR THE PROPOSED LIGHTING PLAN WITH LOCATIONS OF BAT ROOSTS, BIRD NESTS, AND HABITAT FEATURES (SEE SECTION 3.3 FOR DETAILS OF ROOSTS AND NESTS)
LIGHTING PLAN © CARPENTER DAVIES PARTNERSHIP 2023
BACKGROUND IMAGE ©GOOGLE MAPS 2024

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6.0 Ecological Compliance Audit and KPIs

6.1 To ensure that the site lighting is installed in a satisfactory manner, an Ecological Compliance Audit (ECA) will be carried after the works.

6.2 The ECA must be carried out by a suitably experienced ecologist.

6.3 The ECA will involve an audit visit following installation of lighting , which the landowner will be responsible for organising.

6.4 Key Performance Indicators for the ECA are listed in Table 6.1. Copies of all documents will be made available to the auditor and, where specified, should also be available for inspection on site.

6.5 If any of the performance indicators are failed this should be immediately reviewed, and the site lighting amended if it is deemed necessary.

TABLE 6.1. KEY PERFORMANCE INDICATORS

Performance Indicator	Evidence
The installed lighting will be checked and approved by the ecologist.	A report letter confirming the suitability of the new site lighting will be completed by the ecologist.
Following installation of the new site lighting, night-time light levels will be sampled at points across the site including, but not limited to, at the access points to known bat roosts. Light levels must not exceed 0.2 lux (ILP, 2023) at the entrance to bat roosts.	A report letter confirming the results of light sampling will be completed by a lighting engineer.
Bat emergence/activity surveys will be carried out by suitably experienced and licensed ecologists at least twice a year during the main bat activity season (May to September inclusive), for a minimum of three years starting in 2025*. These may be supported by evidence from physical checks of the previously identified roosts. In order to determine that the lighting has had no impact on the local bat population, the following must be demonstrated: • Records of pipistrelle activity within the Foundry Area on at least two occasions during each bat activity season • Records of lesser horseshoes present at least once during each bat activity season * start date is based on the current estimated completion date for the works; the first survey year will be postponed until 2026 if delays mean that there is insufficient time for the surveys in the 2025 bat activity season	A report summarising results of bat activity surveys.

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7.0 References

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