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Biodiversity Enhancement Strategy

Plot 3, land adjacent to Oakfield, Cox Green

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Report Summary

1. Northchurch Homes Ltd commissioned The Ecology Co-op to produce a Biodiversity Enhancement Strategy for a proposed development at Plot 3, on land adjacent to Oakfield. The purpose of this document is to outline targeted compensation and enhancement measures, and details of management responsibilities should they be needed. It will be submitted to Horsham District Council to discharge condition 7 of the approved planning application (DC/23/0235).

2. Subsequent to the approval of the planning application, Horsham District Council detailed that development must not commence until Condition 7 has been discharged. Condition 7 outlines that information regarding the purpose, type and locations of proposed enhancement measures should be submitted to and be approved in writing by the Local Planning Authority.

3. Section 3 of this report sets out the location and type of proposed habitat enhancement measures for the site, involving implementing the following:

- **new native species-rich hedgerow**
- **wildflower areas**
- **bat boxes**
- **bird boxes.**

4. Post-construction management for the proposed biodiversity enhancement features is detailed in full in section 4. Additionally, a works schedule is provided in section 5; an outline of management responsibilities and the competencies of those carrying out the works are outlined in section 6. This section also recommends that a site inspection is undertaken by a suitably qualified ecologist post-construction, to ensure compliance with this report and that all enhancement measures are correctly implemented.

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1 INTRODUCTION

1.1 Purpose of the Report

The Ecology Co-op was commissioned by North Church Homes to produce a Biodiversity Enhancement Strategy for a proposed development on land adjacent to Oakfield. This document outlines targeted enhancement measures and details the correct management and remedial responsibilities of enhancement measures, should they be necessary. Prior to commencement of construction this document must be submitted to and approved in writing by Horsham District Council to discharge Condition 5 of the approved planning application (DC/23/0235).

All the prescribed measures described within this document will be issued to relevant works contractors to ensure that they are carried out in full. The works contractor will also be given contact details for an ecologist so that any potential issues can be resolved promptly.

1.2 Background

The site measures approximately 0.2 ha and is located towards the northern end of Rudgwick, West Sussex. The site is situated in a rural location, with residential housing to the north and south, a road to the east, and pasture fields to the west. The central grid reference for the site is TQ 0926 3472. The location of the site is shown in Figure 1.

The proposed development includes the construction of a single residential dwelling and a garden room, with associated hard and soft landscaping. Proposed plans for the site are shown in Figure 2.

This document has been prepared to fulfill Condition 5 of the approved planning permission, granted by Horsham District Council. The full condition is outlined below:

Condition 5 – Pre-commencement (Slab Level) Condition:

Prior to the commencement of the development above slab level, a Biodiversity Enhancement Layout, providing the finalised details and locations of the enhancement measures contained within the Preliminary Ecological Appraisal (The Ecology Co-op, November 2022) and the Reptile Survey Report (November 2022) shall be submitted to and approved in writing by the local planning authority.

The enhancement measures shall be implemented in accordance with the approved details prior to occupation and all features shall be retained in that manner thereafter.



Figure 1. Site plan. The site boundary is highlighted in red. Image produced courtesy of Google maps (map data ©2022 Google).



Figure 2. The proposed site plan for the proposed residential house north of Oakfield, Rudgwick provided by the client on 21.11.2022.

1.3 Summary of Previous Survey Work

An Ecological Assessment[1] was completed by The Ecology Co-op in November 2022, and this included a reptile presence/likely absence survey. This survey identified a low population of slow worm *Anguis fragilis* with a peak count of one individual. Precautionary mitigation was put forward for breeding birds, dormice *Muscardinus avellanarius*, amphibians, reptiles and hedgehogs *Erinaceus europaeus*.

1.4 Management Plan Strategic Vision

The aims and objectives for the landscape and biodiversity elements of this development project are as follows:

- creation of new green assets involving the planting of species-rich hedgerows and planting wildflower areas;
- provision of targeted and appropriate habitat enhancement features for bats, birds, dormice, and reptiles.

2 LEGAL PROTECTION

Legal protection applying to relevant bird, mammal and herpetofauna species is detailed in Appendix 1 of this report. This includes both national and European legislation that protects species such as [redacted] *Meles meles*, bats, dormice, reptiles and breeding birds.

3 PROPOSED LANDSCAPE AND BIODIVERSITY ASSEST

3.1 Enhancements Overview

The proposed development represents an opportunity for habitat enhancement to benefit bats, breeding birds, reptiles and dormice in line with the recommendations of the National Planning Policy Framework (NPPF). The methods proposed for the creation of each habitat type are described in detail within this section and their locations for implementation are shown in Figure 5.

3.2 Species-rich Hedgerow

A new native species-rich hedgerow will be planted, parallel to the former eastern boundary hedgerow that has been removed under a separate planning application (DC/21/2211). The new hedgerow will run to the west of a retained mature oak tree *Quercus robur,* connecting to the retained northern boundary.

This hedgerow will be planted with a species-rich native mixture to provide valuable shelter and foraging habitat for birds, bats and dormice.

[1] The Ecology Co-op (2019). *Ecological Assessment for Land at 2-4 Addington Road, Sanderstead.*

The hedgerow will include at least five hedge trees per linear metre and comprise of at least 50% hawthorn *Crategous monogyna*. In addition to the hawthorn a mixture of at least five or more native woody species selected from the following will be included, equalling 10% of the hedgerow each:

- wayfaring-tree *Viburnum lantana*;
- wild privet *Ligustrum vulgare*;
- dogwood *Cornus sanguinea*;
- purging buckthorn *Rhamnus cathartica*;
- alder buckthorn *Frangula alnus;*
- guelder rose *Viburnum opulus*;
- rowan *Sorbus aucuparia*;
- dog rose *Rosa canina*;
- hazel *Corylus avellana*; and
- field maple *Acer campestre*.

All native species should be sourced from certified nurseries in the UK, to avoid the spread of disease or pests. Given the arrival of Ash Dieback *Hymenoscyphus fraxine*us (previously known by the names *Chalara fraxinea* and *Hymenoschyphus pseudoalbidus*), it is strongly recommended that current advice from DEFRA, The Forestry Commission and the Woodland Trust is followed regarding the planting of ash species[2].

3.3 Non-native Hedgerow

A new non-native hedgerow will be planted along the southwest boundary that divides this plot from the existing Oakfield residential property. The hedgerow will extend all the way up to the northwest boundary to increase connectivity across the site.

3.4 Wildflower

An area of native wildflower planting will be created between the new native hedgerow along the eastern boundary and the new hard-standing driveway of the proposed dwelling. In addition, two strips of wildflower planting will be created along the northern boundary, at least 2m wide either side of a gate leading into a neighbouring field.

To establish these wildflower areas, a process of light rotavating and seeding will be employed with good ground preparation essential to the success of the wildflower meadow. The sowing process is best undertaken between late August and the end of September during mild and wet weather, which is best suited to seeding, or during mid-March to mid-May when the ground has sufficient moisture and there is very little risk of frosts. The rotavating process is to create an area of largely bare ground to allow the wildflower seed mix to establish. Immediately following rotavating, a suitable seed mixture containing not less than 20 wildflower and grass species should be sown across the ground at a density of four grams per square metre. The species included must all be of native British origin. A

[2] Defra, 2013. *Chalara Management Plan*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221051/pb13936-chalara-management-plan-201303.pdf

recommended seed mixture is EM2 – standard general purpose meadow mixture, which is available from Emorsgate seeds. Appendix 1 details the composition of this mixture.

3.5 Roosting Bats

To provide a net positive benefit for bats within the development, it is proposed that the incorporation of new roosting features for bats should occur in selected locations across the site, close to existing flight-lines and habitat features of value to foraging and commuting bats. Artificial light sources must be positioned facing away from flight-lines and these features.

Two bat access tile sets will be incorporated into the new roof of the proposed dwelling to provide an increase in crevice roosting features. One Beaumaris woodstone Bat Box (Midi) will be affixed to the south or eastern elevation, at least 3m above the ground, close to the eaves and this will also provide a new crevice feature for roosting bats.

One Improved Cavity bat box will be affixed to a retained mature tree on the site. This should be placed on the southern or eastern face of the main trunk, at least 3m high with clear flight paths in and out. This will provide a new roost feature for those species that use cavity spaces.



Figure 3. *Left - 2F Schwegler Bat Box. Middle – Beaumaris Woodstone Bat Box. Right – Chillon WoodStone Bat Box.*

3.6 Nesting Birds

A total of three bird nesting boxes will be installed around the site, placed on retained semi-mature/mature trees. All three of these nest boxes will be general purpose boxes, designed for a wide range of species. Examples of suitable models include the Schwegler 1B bird box (Figure 4) and the Vivara Pro Seville WoodStone nest box. These nest boxes must be placed at least 1.5m above the ground, away from prevailing wind (usually of a south-westerly direction in the UK).

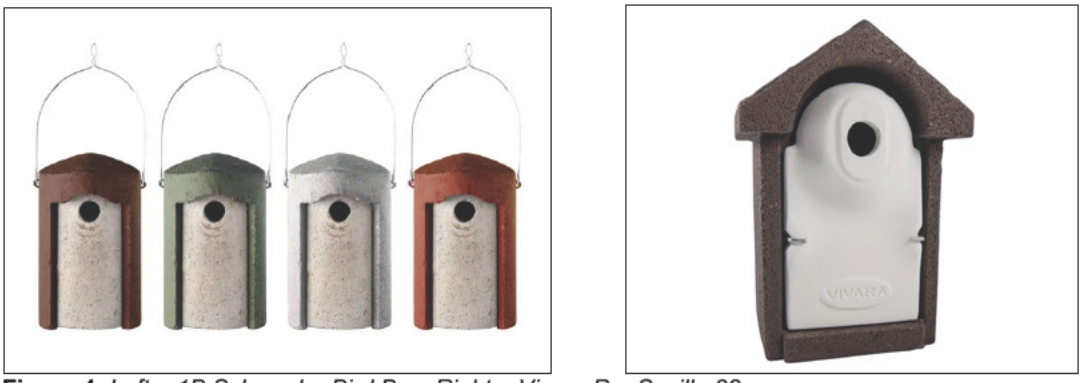

Figure 4. *Left – 1B Schwegler Bird Box. Right – Vivara Pro Seville 32mm.*

3.7 Reptiles

The wildflower areas mentioned above, and new species-rich hedgerow will all provide an enhancement for reptiles creating higher quality foraging habitat as well as places of shelter.

3.8 Proposed Enhancement Plan



Figure 5. The locations of all compensation and enhancement measures mapped onto the proposed site plan.

4 POST CONSTRUCTION MANAGEMENT PLAN

4.1 Hedgerows

Optimal Habitat
A variety of healthy, semi-mature and mature hedgerows, some with trees across the development site.

Yearly Management
The hedgerows should be checked annually for signs of disease and more frequently while new hedgerows are establishing. If disease is identified, advice should be sought from an arboriculturist regarding the appropriate method of treatment.

Tree guards must be inspected yearly for the first five years and then removed if planting is well-established, while establishing saplings must be kept well-watered during extended dry periods. Replacement planting, timed in the next planting season, will be required where the hedgerows shrubs fail to establish.

Hedgerows should be allowed to grow to a height of at least 2.5 metres where possible. Hedge cutting is best carried out every 3 years, however it may be necessary to trim back hedgerows and shrubs annually in some circumstances such as where there is a risk to health and safety. Cutting must only be timed outside the bird nesting season (1st March to 31st August). Where possible, hedgerows shouldn't be cut until February, so that valuable winter food associated with fruiting shrubs and trees is retained for over-wintering birds. For management in the longer term, it is advised to lay or coppice the hedgerow once every 40-50 years to rejuvenate the hedge and prevent any gapping.

4.2 Wildflower Meadow Management

Optimal Habitat
Areas with good species diversity across the site including both grassland and wildflowers. The wildflower habitat must support a variety of flowering plant species to provide colour, texture and ecological value.

Management
As part of on-going management, the wildflower habitat should be cut and gathered once each year to a height of approximately 40–60mm after flowering in August. This process can be carried out through strimming or using a lightweight machine. This is important to ensure that species diversity of the area is maintained, and grass species do not become dominant. Where necessary, a second cut could be taken in March each year if the sward is growing too coarsely. The grassland should not be cut between the 1st of April and mid-August so that plants are given the opportunity to flower. A yearly check for invasive species should be undertaken and appropriate removal of any invasive species identified.

Once the wildflower habitat establishes, it will require little management.



4.3 Other

Bird nesting boxes, should be emptied of nesting material in winter to prevent the build-up of parasites. Bat boxes should only be maintained by a suitably qualified/licensed ecologist, as they may support roosting bats. In the event any boxes become damaged or have fallen down, then they must be replaced as soon as possible.



5 WORK SCHEDULE

Table 2 below provides the timetable to aid correct timing of the annual 'green asset' management for the site.

Table 2. Annual work schedule for the management period.

Action for green assets	**Jan**	**Feb**	**Mar**	**April**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Check hedgerows and trees for signs of any disease							X	X	X			
Cutting of hedgerows and trees	X	X										
Keeping tree sapling(s) well-watered where necessary	X	X	X	X	X	X	X	X	X	X	X	X
Inspection of tree guards and fences	X	X	X	X	X	X	X	X	X	X	X	X
Replacement planting of failed trees or shrubs	X	X	X								X	X
Cutting and gathering of wildflower habitat during the first year					X	X	X	X	X	X		
Cutting and gathering of wildflower habitat on a yearly basis								X				
Inspection of bat and bird, features for loss and damage								X	X	X	X	
Clearance of old nests from bird boxes									X	X	X	

6 COMPETENCIES AND REVIEW OF WORK

All contractors should have a copy of this report, including the proposed locations map, when implementing works relating to the biodiversity enhancement measures. A site inspection should also be undertaken by a suitably qualified ecologist post-construction, to ensure compliance with this report and that all enhancement measures are correctly implemented.

All relevant works must be carried out by someone suitably qualified as follows:

- all tree works are to be undertaken by a suitably qualified arboriculturist;
- the installation of all wildlife boxes will be undertaken or overseen by a suitably qualified ecologist;
- initial and monitoring site inspections will be undertaken by a suitably qualified ecologist.

Should you need any further advice on the information provided above, please do not hesitate to contact The Ecology Co-op.

APPENDIX 1 – Wildlife Legislation and National Planning Policy

Introduction

The following text is intended for general guidance only and does not constitute comprehensive professional legal advice. It provides a summary of the current legal protection afforded to wildlife in general and certain species. It includes current national planning policy relevant to nature conservation.

The 'Birds Directive', 'Habitats Directive' and 'Natura 2000 Sites'.

The Council Directive 79/409/EEC on the Conservation of Wild Birds ("the Birds Directive") sets a framework for the protection of wild birds. Under the Directive, several provisions are made including the designation and protection of 'Special Protection Areas' (SPAs) – areas which support important bird populations, and the legal protection of rare or vulnerable species.

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive") directs member states of the EU to take measures to maintain the favourable conservation status of important habitats and species. This requires the designation of a series of sites which contain important populations of species listed on Annex II of the Directive (for example Bechstein's bat *Myotis bechsteinii*, Barbastelle bat *Barbastella barbastellus* and white-clawed crayfish *Austropotamobius pallipes*. Together with 'Special Areas of Conservation' (SACs), SPAs form a network across Europe of protected areas known as the 'Natura 2000 sites'.

Annex IV lists species in need of more strict protection, these are known as "European Protected Species (EPS)". All bat species, common dormice *Muscardinus avellana*, otter *Lutra lutra* and great crested newts *Triturus cristatus* are examples of EPS that are regularly encountered during development projects.

The 'Habitats Regulations'

The Conservation of Habitats and Species Regulations 2017, as amended (the "Habitats Regulations") is the principle means of transposing the Habitats Directive and the Birds Directive, and updates the Conservation (Natural Habitats, &c.) Regulations 1994 ("the 1994 regulations") in England and Wales.

'Natura 2000' sites, now known as National Site Network sites under the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, receive the highest level of protection under the Regulations which requires that any activity within the zone of influence of these sites would be subject to a Habitats Regulations Assessment (HRA) by the competent authority (e.g. planning authority), leading to an Appropriate Assessment (AA) in cases where 'likely significant effects' to the conservation objectives are identified.

For European Protected Species, Regulation 41 makes it a criminal offence to:

- deliberately capture, injure or kill any such animal;
- deliberately disturb wild animals of such species;
- deliberately take or destroy their eggs (where relevant);
- damage or destroy a *breeding or resting place* of such an animal;
- possess, control, sell or exchange any live or dead animal or plant, of such species;
- deliberately pick, collect, cut, uproot or destroy a wild plant of such species.

The Habitats Directive and Habitats Regulations provide for the derogation from these prohibitions for specific reasons provided certain conditions are met. An EPS licensing regime allows operations that would otherwise be unlawful acts to be carried out lawfully. Natural England is the licensing Authority and, in order to grant a license, ensures that three statutory conditions (sometimes referred to as the 'three derogation tests') are met:

- a licence can be granted for the purposes of "preserving public health or safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment" (Regulation 53 (2) (e);
- a licence can be granted if "there are no satisfactory alternatives" to the proposed action;
- a licence shall not be granted unless the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

Wildlife and Countryside Act (1981) as amended.

This remains one of the most important pieces of wildlife legislation in the UK. There are various schedules to the Act protecting birds (Schedule 1), other animals including insects (Schedule 5), plants (Schedule 8), and control of invasive non-native species (Schedule 9).

Under the Wildlife and Countryside Act (WCA) 1981, all wild birds (with the exception of those listed on Schedule 2), their eggs and nests are protected by law and it is an offence to:

- take, damage or destroy the nest of any wild bird while it is in use or being built
- take or destroy the egg of any wild bird
- disturb any bird listed on Schedule 1, while it is nest building, or at a nest with eggs or young, or disturb the dependant young of any such bird.

Schedule 5 lists all non-avian animals receiving protection to a varied degree. At its strongest, the Act makes it an offence to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturb animals while occupying such places. Examples of species with *full protection* include all EPS, common reptile species, water vole *Arvicola amphibius*, white-clawed crayfish *Austropotamobius pallipes* and Roman snail *Helix pomatia*. Other species are protected from sale, barter or exchange only, such as white letter hairstreak *Satyrium w-album*.

The Act makes it an offence to intentionally pick, uproot or destroy any plant or seed, and sell or possess any plant listed on Schedule 8. It is also an offence to intentionally uproot any wild plant not listed on Schedule 8 unless authorised [by the land owner]. Species on Schedules 5 and 8 are reviewed every 5 years when species can be added or removed.

Measures for the prevention of spreading non-native species which may be detrimental to native wildlife is included in the Act, which prohibits the release of animals or planting of plants into the wild of species listed on Schedule 9 (for example Japanese knotweed *Fallopia japonica*, Himalayan balsam *Impatiens glandifera*, New Zealand Pygmyweed *Crassula helmsii*).

The Wildlife and Countryside Act 1981 (as amended) also prohibits certain inhumane methods of traps and devices for the capture or killing of wild animals and certain additional methods such as fixed trap, poisoning with gas or smoke, or spot-lighting with vehicles for killing species listed on Schedule 6 of the Act (this includes all bat species, [redacted] otter, polecat, dormice, hedgehog and red squirrel).

Natural Environment and Rural Communities (NERC) Act (2006)

The NERC Act (2006) created the statutory nature conservation body Natural England, and places a statutory duty on all public bodies, including planning authorities, under Section 40, to take, or promote the taking by others, steps to further the conservation of *habitats and species of principal importance for the conservation of biodiversity* in England (commonly referred to as the 'Biodiversity Duty'). This duty extends to all public bodies the biodiversity duty of Section 74 of the Countryside and Rights of Way (CROW) Act 2000, which placed a duty only on Government and Ministers. Section 41 of the NERC Act lists the habitats and species of principle importance. This includes a wide range of species from mosses, vascular plants, invertebrates through to mammals and birds. It originates from the priority species listed under the UK Biodiversity Action Plan (UK BAP) with some omissions and additions.

[redacted]

Environment Act (2023)

The Environment Act sets a target of halting the decline in species through the inclusion of a legally binding 2030 species abundance target. Aiming to restore natural habitats and enhance biodiversity, the Act requires new developments to improve or create habitats for nature (through mechanisms such as mandatory Biodiversity Net Gain), and tackle deforestation. Going forwards, UK businesses will need to look closely at their supply chains as amongst other measures they will be prohibited from using commodities associated with wide-scale deforestation. Woodland protection measures are also strengthened through the Act.

The Act enables the reform of the Habitats Regulations and further improves protection for nature through the establishment of Local Nature Recovery Strategies that support national Nature Recovery Networks. In addition, the Act provides for the production of Protected Site Strategies and Species Conservation Strategies, aimed at supporting the design and delivery of strategic approaches to deliver better outcomes for nature.

National Planning Policy Framework

The National Planning Policy Framework (NPPF 2023)[3] sets out the Government's view on how planners should balance nature conservation with development and helps ensure that Government meets its biodiversity commitments with regard to the operation of the planning system.

[3] HM Government (2023). National Planning Policy Framework. Department for Levelling up, Housing and Communities. Available online at: https://assets.publishing.service.gov.uk/media/65a11af7e8f5ec000f1f8c46/NPPF_December_2023.pdf



Paragraph 179b, which states that council policies should "*promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity*." The Office of the Deputy Prime Minister (ODPM) Circular 06/2005, 2005)[4]. In accordance with the NPPF, it is important that developments should contribute to and enhance the natural and local environment by:

- minimising impacts on existing biodiversity and habitats;
- providing net gains in biodiversity and habitats, wherever possible;
- establishing coherent ecological networks that are more resilient to current and future pressures.

UK Post-2010 Biodiversity Framework

The UK Biodiversity Action Plan (UK BAP), first published in 1994, was the UK's response to the commitments of the Rio Convention on Biological Diversity (1992) until 2010, when the UK BAP was replaced by the UK Post-2010 Biodiversity Framework. This framework covers the period 2011 to 2020 and forms the UK government's response to the new strategic plan of the United Nations Convention on Biodiversity (CBD) published in 2010. This promotes a focus on individual countries delivering target for protection for biodiversity through their own strategies.

The most recent biodiversity strategy for England, 'Biodiversity 2020: A strategy for England's wildlife and ecosystem services' was published by Defra (2011), and a progress update was provided in July 2013 (Defra 2013).

'Biodiversity 2020' builds on the Natural Environment White Paper for England – 'The Natural Choice', published on 7 June 2011, and sets out the strategic direction for biodiversity policy for the next decade.

Biodiversity 2020 deliberately avoids setting specific targets and actions for local areas and species because the Government believes that local people and organisations are best placed to decide how to implement the strategy in the most appropriate way for their local area or situation.

Birds of Conservation Concern (BoCC)

In 1996, the UK's leading non -governmental bird conservation organisations listed the conservation status of all bird species in the UK against a series of criteria relating to their population size, trends and relative importance to global conservation. The lists, known as the 'Red', 'Amber' and 'Green' lists (in order of decreasing concern) are used to inform key conservation policy and decisions. The lists are reviewed every five years and are a useful reference for determining the current importance of a particular site for birds. The most recent review was undertaken in 2021 (Stanbury et al, 2015), which provides an up to date assessment of the conservation status of birds in the UK.

References

[4] HM Government (2005) ODPM Circular 06/05 Government Circular: *Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7692/147570.pdf.

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Wildlife and Countryside Act (WCA) (1981). HMSO London. Available at: http://www.legislation.gov.uk/ukpga/1981/69/contents

APPENDIX 2 – Reducing Impacts of Artificial Light

Bright external lighting can have a detrimental impact upon foraging and commuting bat flight paths, but more importantly can also cause bats to remain in their roosts for longer. Artificial lighting can also cause significant impacts to other nocturnal species, most notably moths and other nocturnal insects. It can also result in disruption of the circadian rhythms of birds, reducing their fitness.

Guidelines issued by the Bat Conservation Trust[5] should be referred to when designing the lighting scheme. Note that lighting designs in very sensitive areas should be created with consultation from an ecologist and using up-to-date bat activity data where possible. The guidance contains techniques that can be used on all sites, whether a small domestic project or larger mixed-use, commercial or infrastructure development. This includes the following measures:

Avoid lighting key habitats and features altogether

There is no legal duty requiring any place to be lit. British Standards and other policy documents allow for deviation from their own guidance where there are significant ecological/environmental reasons for doing so. It is acknowledged that in certain situations lighting is critical in maintaining safety, such as some industrial sites with 24-hour operation; however, in the public realm, while lighting can increase the perception of safety and security, measurable benefits can be subjective. Consequently, lighting design should be flexible and be able to fully consider the presence of protected species.

Apply mitigation methods to reduce lighting to agreed limits in other sensitive locations – lighting design considerations

Where bat habitats and features are considered to be of lower importance or sensitivity to illumination, the need to provide lighting may outweigh the needs of bats. Consequently, a balance between a reduced lighting level appropriate to the ecological importance of each feature and species, and the lighting objectives for that area will need to be achieved. The following are techniques which have been successfully used on projects and are often used in combination for best results:

- dark buffers, illuminance limits and zonation;
- sensitive site configuration, whereby the location, orientation and height of newly built structures and hard standing can have a considerable impact on light spill;
- consideration of the design of the light and fittings, whereby the spread of light is minimised ensuring that only the task area is lit. Flat cut-off lanterns or accessories should be used to shield or direct light to where it is required. Consideration should be given to the height of lighting columns. It should be noted that a lower mounting height is not always better. A lower mounting height can create more light-spill or require more columns. Column height should be carefully considered to balance task and mitigation measures. Consider no lighting solutions where possible such as white lining, good signage, and LED cats eyes. For example, light only high-risk stretches of roads, such as crossings and junctions, allowing headlights to provide any necessary illumination at other times;
- screening, whereby light spill can be successfully screened through soft landscaping and the installation of walls, fences and bunding;
- glazing treatments, whereby glazing should be restricted or redesigned wherever the ecologist and lighting professional determine there is a likely significant effect upon key bat habitat and

[5] Bat Conservation Trust and Institute for Lighting Professionals (2018) Guidance note 8. Bats and Artificial Lighting. https://www.theilp.org.uk/documents/guidance-note-8-bats-and-artificial-lighting/

features;

- creation of alternative valuable bat habitat on site, whereby additional or alternative bat flightpaths, commuting habitat or foraging habitat could result in appropriate compensation for any such habitat being lost to the development;
- dimming and part-night lighting. Depending on the pattern of bat activity across the key features identified on site it may be appropriate for an element of on-site lighting to be controlled either diurnally, seasonally or according to human activity. A control management system can be used to dim (typically to 25% or less) or turn off groups of lights when not in use.

Demonstrate compliance with illuminance limits and buffers

- *Design and pre-planning phase*; it may be necessary to demonstrate that the proposed lighting will comply with any agreed light-limitation or screening measures set as a result of your ecologist's recommendations and evaluation. This is especially likely to be requested if planning permission is required.
- *Baseline and post-completion light monitoring surveys*; baseline, pre-development lighting surveys may be useful where existing on or off-site lighting is suspected to be acting on key habitats and features and so may prevent the agreed or modelled illuminance limits being achieved.
- *Post-construction/operational phase compliance-checking;* as a condition of planning, post-completion lighting surveys by a suitably qualified person should be undertaken and a report produced for the local planning authority to confirm compliance. Any form of non-compliance must be clearly reported, and remedial measures outlined. Ongoing monitoring may be necessary, especially for systems with automated lighting/dimming or physical screening solutions.

Lighting Fixture Specifications

The Bat Conservation Trust recommends the following specifications for lighting on developments to prevent disturbance:

- Lighting spectra: peak wavelength >550nm
- Colour temperature: <2700K (warm)
- Reduction in light intensity
- Minimal UV emitted
- Upward light ratio of 0% and good optical control

Further reading:

Buglife (2011) A review of the impact of artificial light on invertebrates.

Royal Commission on Environmental Pollution (2009) Artificial light in the environment. HMSO, London. Available at: https://www.gov.uk/government/publications/artificial-light-in-the-environment

Rich, C., Longcore, T., Eds. (2005) Ecological Consequences of Artificial Night Lighting. Island Press. ISBN 9781559631297.

CPRE (2014) Shedding Light: A survey of local authority approaches to lighting in England. Available

at: http://www.cpre.org.uk/resources/countryside/dark-skies/item/3608-shedding-light

Planning Practice Guidance guidance (2014) When is light pollution relevant to planning? Available at: https://www.gov.uk/guidance/light-pollution

Institution of Lighting Professionals (2021) Guidance Notes for the Reduction of Obtrusive Light GN01:2011. Available at: https://www.theilp.org.uk/resources/free-resources/

Voigt, C.C., Azam, C., Dekker, J., Ferguson, J., Fritze, M., Gazaryan, S., Hölker, F., Jones, G., Leader, N., Lewanzik, D. and Limpens, H., 2018. *Guidelines for consideration of bats in lighting projects*. Unep/Eurobats. Available at: https://cdn.bats.org.uk/uploads/pdf/Resources/EUROBATSguidelines8_lightpollution.pdf?v=1542109376

Table 1. EM2 Standard General Purpose Meadow Mixture

Wildflowers		
%	**Latin name**	**Common name**
0.75	*Achillea millefolium*	Yarrow
0.45	*Agrimonia eupatoria*	Agrimony
1.95	*Centaurea nigra*	Common Knapweed
1.05	*Daucus carota*	Wild Carrot
1.2	*Galium verum*	Lady's Bedstraw
0.9	*Knautia arvensis*	Field Scabious
0.3	*Lathyrus pratensis*	Meadow Vetchling
1.8	*Leucanthemum vulgare*	Oxeye Daisy
1.95	*Malva moschata*	Musk Mallow
1.8	*Plantago lanceolata*	Ribwort Plantain
1.2	*Poterium sanguisorba ssp sanguisorba*	Salad Burnet
0.75	*Primula veris*	Cowslip
0.3	*Prunella vulgaris*	Selfheal
0.6	*Ranunculus acris*	Meadow Buttercup
Grasses		
8.5	*Agrostis capillaris*	Common Bent
29.75	*Cynosurus cristatus*	Crested Dogstail
25.50	*Festuca rubra*	Red-fescue
4.25	*Phleum bertolonii*	Smaller Cat's-tail
17	Poa pratensis	Smooth-stalked Meadow-grass