



**JOHNS**  
ASSOCIATES

# Trowbridge Bat Mitigation Strategy SPD

## Draft for Consultation



Prepared in support of the  
Draft Wiltshire Housing Sites  
Allocations Plan

February 2019

## Wiltshire Council

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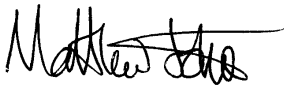
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# 1 SUMMARY

This Trowbridge Bat Mitigation Strategy (TBMS) is aimed at developers, consultants and planners involved in assessing development proposals in the landscapes in and surrounding Trowbridge.

The overall aim is to provide a clear and detailed approach to considering impacts of development in the Trowbridge area on the Bath and Bradford on Avon Bats Special Area of Conservation (SAC). This will help inform strategic planning for the area's future housing needs.

The landscape surrounding Trowbridge is known to be of high importance for bats, supporting at least 14 of the 18 UK bat species. This includes all four of the rarer UK species listed on Annex II of the Habitats Directive (European Council, 1992): greater horseshoe, lesser horseshoe, Bechstein's and barbastelle bats.

In particular, woodlands to the east and south east of Trowbridge are known to support a large and internationally-significant breeding meta-population of Bechstein's bat that is linked to the Bath and Bradford on Avon Bats SAC, including significant maternity colonies in Biss Wood, Green Lane Wood and Clanger and Picket Wood.

Significant potential effects to the SAC therefore include impacts to the foraging areas and commuting routes in the surrounding landscape used by the bats as well as roosts and can include:

- **Habitat degradation** – alteration / demolition / removal of a potential roost feature including changes to environmental conditions (temperature, humidity, internal light levels etc); loss, damage or change of management of potential foraging habitat; or removal / fragmentation / modification of habitats in a potential commuting corridor;
- **Lighting** – increased artificial lighting affecting potential roosting, foraging and commuting features;
- **Noise and vibration** – construction / demolition activities close to potential roost features;
- **Recreational disturbance** – increasing the risk of recreational visits, both organised and informal. This can result in impacts such as: trampling of vegetation, leading to changes in species composition, loss of vegetation and erosion; disturbance from the presence of people and their activities; 'general' urban effects: dumping of waste, damage, vandalism, fires; and spread of plants including alien species.
- **Pollution** – dust and fumes close to potential roost features; and
- **Mortality** – e.g. predation by domestic cats at roost entrances, collision risk from road traffic and wind turbines.

The Wiltshire Core Strategy (Core Policy 29) anticipates a significant level of growth at Trowbridge over the period up to 2026, including 2,600 homes to the south-east of the town for a mixed-use allocation at Ashton Park. Moreover, the draft Wiltshire Housing Site Allocation Plan (HSAP) proposes to allocate additional land for housing in order to support the strategy for the town and thereby help address the indicative housing requirements set out in Core Policy 29 of the Wiltshire Core Strategy (WCS). This document considers the requirements of new housing to be delivered under the HSAP and in accordance with Core Policies 2 and 29 up to 2026.

It is essential that pre-application advice is sought at a very early stage through a formal pre-application request in order to understand how the Council Ecologists are approaching this matter and to reduce the risk of applications being unsuccessful or delayed. The necessary mitigation measures for bats will work when integrated as a fundamental component of the scheme design; but conversely, are unlikely to be successful when tacked on to a scheme retrospectively.

The areas to which this strategy applies are shown in Figure 4 and Figure 5. The key areas have been zoned according

to the level and nature of bat sensitivity within each area.

This document has been created to address development in the Trowbridge area and in particular the Housing Sites Allocations Plan, the extents to which this strategy applies are therefore restricted to a combination of the Community Area and suitable buffer areas surrounding the strategic woodlands. Any development proposals outside of these zones, and therefore the scope of this document, will still be subject to detailed assessment in relation to the potential impacts on bats and will require separate mitigation measures independent of those described within this document. These mitigation requirements are beyond the scope of this document.

The requirements relating to each zone are:

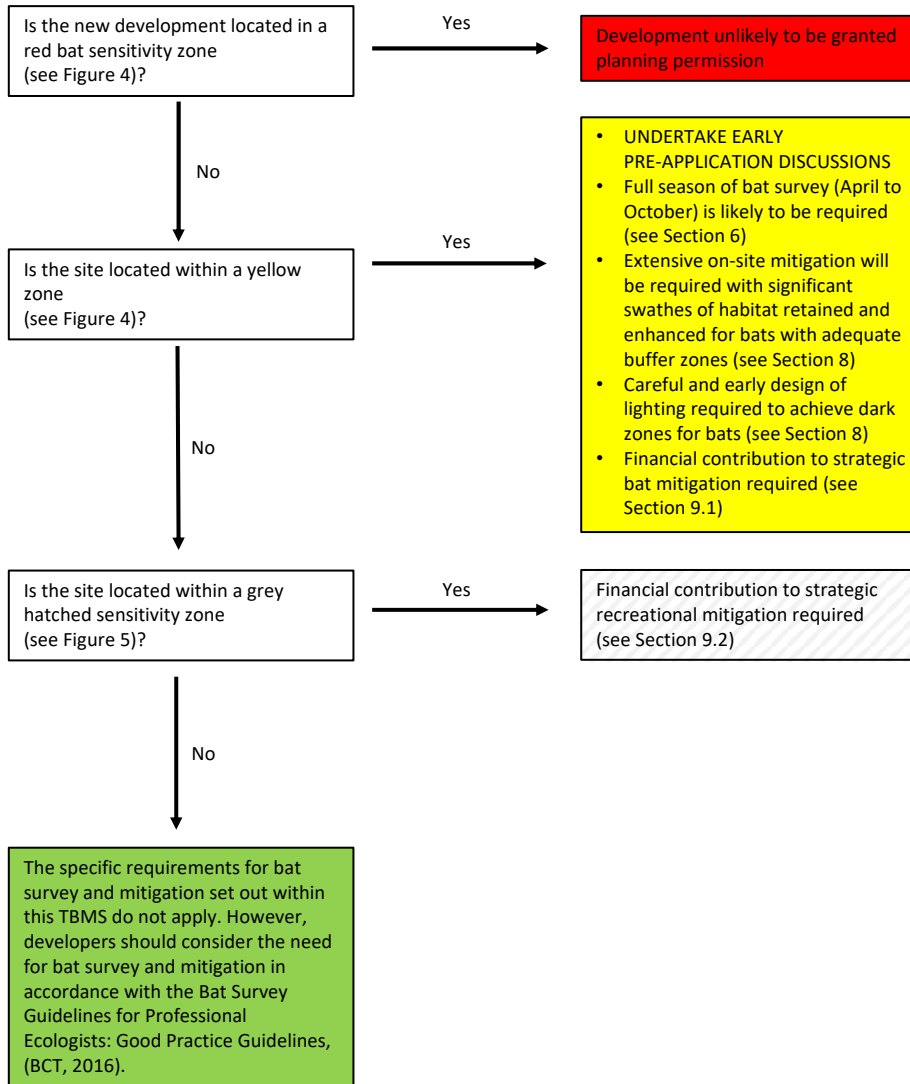
- Red Zone
- new development unlikely to be granted permission
- Yellow Zone
- Development proposals within these zones **must provide appropriate survey of bats** – see Section 6.
- Development proposals within these zones must **mitigate for all impacts on target bat species on site** through retaining and enhancing wide swathes of unlit bat habitat with associated buffer zones. Housing is expected to be provided at lower density to achieve this. Development areas and the area required for bat mitigation for each allocated site within the HSAP have been estimated and are set out in Table 4. For each allocated site, it is anticipated that in most circumstances the full residual green space will be required for mitigation. See Section 8 for on-site mitigation requirements.
- Development proposals within these yellow zones should expect to make a **payment for habitat mitigation** – see Section 9.1
- Grey (hatched) Zone
- Development proposals within should expect to make a **payment for recreational mitigation** – see Figure 5 and Section 9.2 As a minimum, the Footprint Ecology Report on recreational pressures in relation to the important woodlands that support the bats, states that (para 6.46) the outer limit of the zone of influence should comprise the settlements of Trowbridge and Westbury.

A flow chart summarising decision making and what is likely to be expected is presented in Figure 1 overleaf.



Figure 1 Decision Flowchart

## FLOW CHART FOR NEW DEVELOPMENT IN THE TROWBRIDGE COMMUNITY AREA



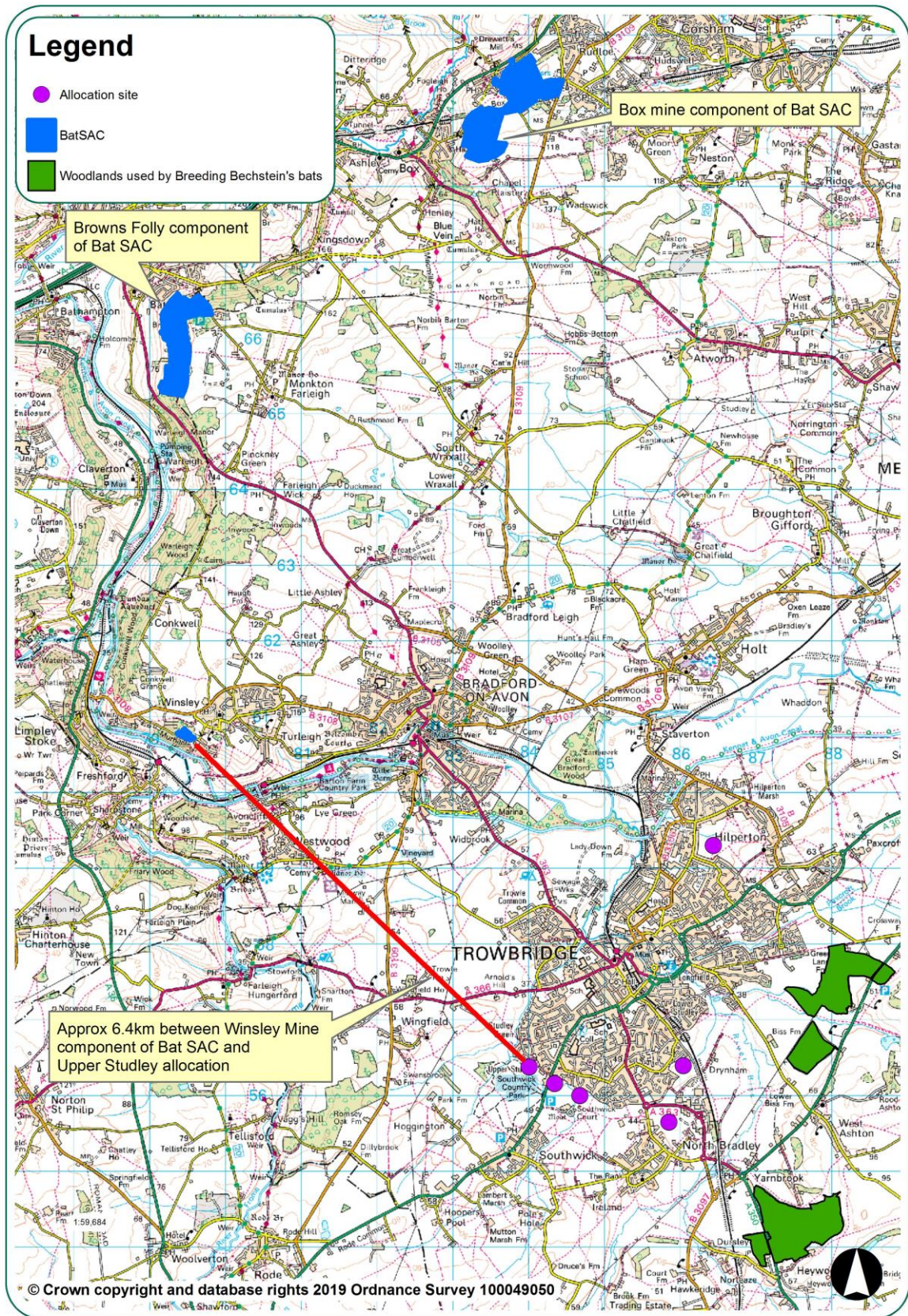
N.B. Financial contributions will be bound by the provisions of the CIL Regulations 2010.

## 2 INTRODUCTION

### 2.1 The Trowbridge woods and the SAC

1. The landscape surrounding Trowbridge is known to be of high importance for bats, supporting at least 14 of the 18 UK bat species. This includes rarer UK species listed on Annex II of the Habitats Directive (European Council, 1992): greater horseshoe, lesser horseshoe, and Bechstein's bats.
2. In particular, woodlands to the east and south east of Trowbridge are known to support a large and internationally-significant breeding meta-population of Bechstein's bat, including significant maternity colonies in Biss Wood, Green Lane Wood and the woods extending to Clanger and Picket Wood (see Figure 3).
3. The meta-population of Bechstein's bats has been shown to be functionally linked to the Bath and Bradford on Avon Bats Special Area of Conservation (SAC) located approximately 6.4km to the north west (see Figure 2). The SAC is designated for supporting internationally important populations of hibernating greater horseshoe, lesser horseshoe and Bechstein's bat. The internationally important designation of Bath and Bradford-on-Avon Bats SAC is comprised of a network of significant underground sites in both the Wiltshire and BANES administrative areas, including four nationally important Sites of Special Scientific Interest (SSSIs), namely Box Mine, Winsley Mines, Combe Down and Bathampton Down Mines, and Brown's Folly. These component sites comprise extensive networks of caves, mines and man-made tunnels which are used by bats for hibernation, breeding, mating and as a staging post prior to dispersal. Box Mine SSSI is also known to support a breeding colony of greater horseshoe bat. Figure 1 also illustrates the location of the allocations proposed in the draft Wiltshire Housing Site Allocations Plan in the context of the SAC and woodlands.
4. The landscape surrounding Trowbridge is also known to be important for greater and lesser horseshoe bats, with roosts of conservation significance recorded in the area. It is highly likely that bat populations associated with these local roosts are also associated with the Bath and Bradford on Avon Bats SAC.

Figure 2 Location of Sites



## 2.2 Potential impacts to the SAC from development

5. The network of significant roosts for the species of bat associated with the SAC includes sites that are not covered by any statutory designation, including the breeding colonies of Bechstein's bats associated with the Trowbridge woods. The landscape surrounding all significant roost sites is critical to maintain the populations. Foraging areas used by bats vary between species and throughout the year, and include a wide range of habitats which support their invertebrate prey. Suitable semi-natural habitats such as woodlands, mature hedgerows, grazed pasture, rough grassland, watercourses and wetlands closest to bat roosts are most likely to be important to the bat populations, particularly for juveniles, however some species are highly mobile and may forage several kilometres from their roosts on a regular basis.
6. In order to migrate between the network of summer, winter and transitory roosts, autumn swarming sites and the commute to and from their numerous foraging areas, bats use established 'commuting corridors'. Although bats are capable of crossing (and frequently do cross) large open areas, good quality connective habitats are preferred. These are generally well vegetated, sheltered linear features that provide direct routes between foraging areas and roosts. They generally provide some protection from predators; and the sheltered conditions also ensure that the bats use less energy in flight rather than flying into the wind e.g. hedgerows, scrub along railway embankments.
7. Significant potential effects to the SAC therefore include impacts to the foraging areas and commuting routes in the surrounding landscape used by the bats as well as roosts and can include:
  - **Habitat degradation** - alteration / demolition / removal of a potential roost feature including changes to environmental conditions (temperature, humidity, internal light levels etc); loss, damage or change of management of potential foraging habitat; or removal / fragmentation / modification of habitats in a potential commuting corridor;
  - **Lighting** – increased artificial lighting affecting potential roosting, foraging and commuting features;
  - **Noise and vibration** – construction / demolition activities close to potential roost features;
  - **Recreational disturbance** – increasing the risk of recreational visits, both organised and informal. This can result in impacts such as: trampling of vegetation, leading to changes in species composition, loss of vegetation and erosion; disturbance from the presence of people and their activities; 'general' urban effects: dumping of waste, damage, vandalism, fires; and spread of plants including alien species.
  - **Pollution** – dust and fumes close to potential roost features; and
  - **Mortality** – e.g. predation by domestic cats at roost entrances, collision risk from road traffic and wind turbines.

### 3 WHY IS THERE A NEED FOR A TROWBRIDGE BAT STRATEGY?

8. Wiltshire Council is in the process of preparing the Wiltshire Housing Site Allocations Plan. The context for this Plan is essentially established by the adopted Wiltshire Core Strategy (WCS). Its primary purpose is therefore to help maintain a rolling five-year supply of housing across Wiltshire's three Housing Market Areas in accordance with the WCS.
9. The Wiltshire Core Strategy (WCS) (Core Policy 29) anticipates a significant level of growth at Trowbridge over the period up to 2026, including 2,600 homes to the south-east of the town for a mixed-use allocation at Ashton Park. Moreover, the draft Wiltshire Housing Site Allocations Plan (HSAP) proposes to allocate additional land for housing in order to support the strategy for the town and thereby help address the indicative housing requirements set out in Core Policy 29 of the WCS.
10. Based on evidence gathered to date, one of the most significant challenges to delivering growth at Trowbridge is the presence of protected bat species and their habitat around the town. Habitats Regulations Assessment work undertaken to date in respect of the planned strategy for growth and recent planning applications, has identified potential risks to the Bath and Bradford-on-Avon Bats Special Area of Conservation (SAC). These risks relate to direct loss of habitat used by bats for foraging and commuting; recreation pressure in woodlands and other spaces used by the bats for breeding and foraging; and in-combination effects of applications in the Trowbridge and wider area (e.g. cumulative effects of lighting). While recreation impacts relate mainly to proposed housing, direct impacts on habitats and cumulative effects also relate to other uses such as commercial and employment. As such, future development proposals at Trowbridge, be they planned or speculative, have the potential to adversely affect populations of Bechstein's, greater horseshoe and lesser horseshoe bat and therefore the designated features protected by the SAC designation that support these species.
11. This document seeks to address adverse impacts through avoidance and mitigation measures that ensure:
  - the capacity and permeability of the landscape to support foraging and commuting Bechstein's, greater horseshoe and lesser horseshoe is maintained (through a network of habitat enhancement, restoration and creation, including the opportunity to create new roosts). This mitigation will support the viability of the bat populations; and ensure that they are sufficiently robust to respond dynamically to landscape change.
  - adequate mitigation is provided for the increased recreational pressures to the core woodland sites that will result from additional residential development. This will be aimed at diverting people away from the woodland sites to alternative countryside sites and will comprise: development exclusion zones around the woodlands; improved management of the woodland sites themselves; and improvements to the recreational opportunities (away from the woods) available to the residents of Trowbridge. As a minimum, the Footprint Ecology Report on recreational pressures states that (para 6.46) the outer limit of the zone of influence for recreational pressure should comprise the settlements of Trowbridge and Westbury. See Figure 5.
12. This Strategy has therefore been written to set out at a strategic level the mitigation that will be required in association with development to be confident that significant adverse effects to the SAC are avoided.

## 3.1 Legislative Background

13. The Bath and Bradford-on-Avon Bats SAC (the SAC) is a European Site designated under the Habitats Directive 92/43/EEC (European Council, 1992), which is transposed into UK law under the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) (UK Government, 2017). The [Citation](#) that supports the SAC designation represents a formal description of the reasons why the site has been designated for its conservation importance. SACs are afforded stringent legal protection under Regulation 63 of the Habitats Regulations. The legal protection conferred to SACs is complex, however, in summary, permission cannot be granted for development which will adversely affect the integrity of a SAC unless the conditions of three prohibitive tests (the 'derogation tests') are met. When deciding whether the integrity of a SAC would be adversely affected by development, the legislation requires the application of the precautionary principle, i.e. where there is 'reasonable scientific doubt' as to whether an adverse effect on the integrity of the site would occur, development should not be permitted (unless the three derogation tests are met).
14. Regulation 63 of the Habitats Regulations requires the decision-taker (or 'Competent Authority') to undertake a strict step-wise assessment process for any plans or projects to ascertain potential impacts on European Sites and whether the 'integrity' of the European Site will be adversely affected. This assessment process is known as 'Habitats Regulations Assessment' (HRA). It is important to note that HRA must be applied to 'plans' as well as 'projects'. This means that strategic local plan documents (including the Wiltshire Core Strategy and the Wiltshire Housing Site Allocations Plan) must be subject to HRA as well as individual developments which are subject to planning applications. In practice, HRA at the strategic 'plan' level enables more meaningful consideration of potential 'in-combination' impacts; and means that strategic mitigation can be applied effectively to deal with such cumulative effects.
15. A series of [Conservation Objectives for the SAC](#) have been published for the Bath and Bradford on Avon Bats SAC, which provide a statutory framework for decision making in respect of development proposals and therefore help inform 'HRAs undertaken at the plan and project (planning application) level. In addition, they are to be used to inform the design and delivery of mitigation measures deemed necessary to conserve or restore the SAC and/or to prevent the deterioration or significant disturbance of its qualifying features as required by the provisions of Article 6(1) and 6(2) of the Habitats Directive. The Site Improvement Plan prepared for the SAC by Natural England identifies an action for planning authorities to produce and promote guidance to inform strategic planning and enable developers to take full account of the SAC in their schemes. The Trowbridge Bat Mitigation Strategy helps to fulfil this priority requirement.

## 3.2 Policy background

### 3.2.1 National Planning Policy

16. National planning policy is set out within the National Planning Policy Framework (NPPF) (UK Government, 2018). The NPPF is clear that pursuing sustainable development includes moving from a net loss of biodiversity to achieving net gains for nature, and that a core principle for planning is that it should contribute to conserving and enhancing the natural environment.
17. Paragraph 174 of the NPPF requires planning policy to plan for biodiversity at a landscape-scale across local authority boundaries. Planning policy should identify and map components of the local ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity, wildlife corridors and stepping stones that connect them and areas identified by local partnerships for habitat restoration or creation. Paragraph 170 requires planning

policy and decisions to minimise impacts on and provide net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.

18. Paragraphs 171, 174, 176 and 177 underline the overriding importance of European sites and removes the presumption in favour of sustainable development (paragraph 11) where development requiring appropriate assessment under the Birds or Habitats Directives is being considered, planned or determined.

### 3.2.2 Wiltshire Core Strategy

Table 1 Delivery of Housing 2006 to 2026 (Trowbridge Community Area) based on completions, developable commitments

	Indicative housing requirement 2006-2026	Less Completions 2006 - 17	Less Developable commitments	Indicative remaining requirement	calculations Sum B+C+D	
Trowbridge Town	6,810	-3,019	-1,561	2,230	2,230	
Remainder	165	-256	-32	0 (1)	-123	
Community Area (CA) total	6,975	-3,275	-1,593	2,107 (2)	2,107	Shortfall against CS predicted housing supply
[1] The actual delivery from completions and existing commitments for the CA remainder will be in excess of the indicative requirement by 123 dwellings						
[2] This figure takes into account the 123 dwellings to be delivered in excess of the indicative requirement for the CA remainder.						

19. The development plan for Wiltshire provides the starting point for the consideration of development proposals within the county. It comprises a suite of documents including the adopted Wiltshire Core Strategy (WCS) (Wiltshire Council, 2015). The WCS presents a strategy for how Trowbridge will grow over the period 2006 to 2026 and anticipates significant levels of housing to be built as set out above.
20. The policies of the development plan need to be read as a whole. For Trowbridge, the context for development is essentially established by Core Policies 1 (Settlement Strategy), 2 (Delivery Strategy), 28 (Trowbridge Central Areas of Opportunity) and Core Policy 29 (Spatial Strategy: Trowbridge Community Areas) of the WCS. These provide the direction for how the town will change through the Plan period up to 2026.
21. The WCS include a strategic allocation for 2600 homes, the Ashton Park Urban Extension to the south-east of Trowbridge. Whilst the focus for planned housing delivery is upon Ashton Park, there remains a requirement for further housing as part of Core Policy 29 to be delivered over the period to 2026. Core Policy 29 states that it would be the role of the forthcoming Development Plan Document (the Housing Site Allocations Plan) to identify and allocate further land for additional housing at the town.

The extent of the indicative residual requirement is significant (approximately 2,107 houses) as set out within the Council's housing land supply information - see Table 1 above<sup>1</sup> .

22. Core Policy 50 within the WCS provides protection for features of biodiversity and geological value. As a result of Core Policy 50, development potentially affecting the Bath and Bradford on Avon SAC must provide avoidance and mitigation measures to ensure no adverse impact on integrity of the site. Core Policy 50 also requires development to be undertaken in accordance with the Wiltshire Council Bat SAC Guidance (Wiltshire Council, September, 2015).
23. Provision of a coherent and linked landscape for bats is also in accordance with Core Policy 52, which requires development to make provision for the retention and enhancement of the local green infrastructure network. This includes the requirement to identify and provide opportunities to enhance and improve linkages between the natural and historic landscapes of Wiltshire.
24. A HRA of the WCS was undertaken during its preparation (WSP, February, 2012) (WSP, March 2013) (Wiltshire Council, April 2014). The HRA concluded, in agreement with Natural England, that in principle the general quantum of development at Ashton Park could be delivered without having an adverse effect upon the integrity of the local Bechstein's bat populations, subject to sensitive design and incorporation of mitigation measures identified in the Development Template included in the WCS. Subsequently, the Council resolved to grant outline planning permission for this site on 25 April 2018 subject to the prior completion of a Section 106 legal agreement. The application was subject to comprehensive ecological survey and assessment dating back to 2013 (Pegasus Group, August, 2017). The HRA undertaken for this site (Wiltshire Council, February, 2018) concluded that the range of mitigation to be provided for lesser horseshoe and Bechstein's bat and the mechanisms proposed to secure it are sufficient to remove any doubt that the Council may otherwise have had as to the absence of adverse effects on the integrity of the Bath and Bradford on Avon Bats SAC. As such, Wiltshire Council concluded that the project (as proposed in planning application 15/04736/OUT) would not have an adverse effect on the integrity of the Bath and Bradford on Avon Bats SAC, either alone or in combination with other plans and projects.
25. However, the HRA of the WCS (Wiltshire Council, April 2014) could not reasonably assess the effects of the remaining houses to be provided at Trowbridge as part of Core Policy 29 as those effects will be dependent upon the location, scale and nature of the development sites, which was unspecified within the WCS. Core Policy 29 therefore stipulates that provision of additional dwellings requires further assessment of effects on protected bat species and their habitats to ensure they are properly safeguarded. The HRA therefore concluded that the effects of the additional housing to be provided within the Trowbridge Community Area should be further assessed under the HRA accompanying the relevant subsequent planning document which allocates such land (the Housing Site Allocations Plan – see below).

### 3.2.3 Draft Wiltshire Housing Site Allocations Plan

26. The draft Wiltshire Housing Site Allocations Plan (HSAP) (Wiltshire Council, July, 2018) and associated Proposed Changes (September 2018) is being prepared to support the delivery of housing within Wiltshire by helping to address the residual indicative WCS housing requirements. At Trowbridge, the HSAP identifies specific development sites in order to provide greater certainty that the indicative housing requirement in Core Policy 29 can be achieved by 2026.

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1 Source: Topic Paper 3 Housing Land Supply Addendum (July 2018)



27. The HSAP proposes to allocate six sites that will deliver approximately 1050 new homes on greenfield land over the plan period to 2026. These proposals have been rigorously tested through Sustainability Appraisal (SA) and HRA.
28. The HRA for the Pre-Submission Draft Wiltshire Housing Site Allocations Plan (Wiltshire Council, June, 2017) concludes that:
- 'Recent evidence has shown that housing expansion on the eastern edge of Trowbridge is generating increased visitor pressure at ancient woodlands which support an important colony of Bechstein's bats associated with the SAC. Further allocations at the town could exacerbate this, particularly when considered in combination with planned growth such as the Ashton Park Urban Extension. The options closest to the woodlands, and therefore most likely to contribute to the number of visits, have been removed from the plan and the Council is currently preparing a Trowbridge Recreation Management Mitigation Strategy to address any residual effects in relation to this issue. It is therefore concluded that the plan would not have an adverse effect upon the SAC through increased recreational pressure, subject to the implementation of that mitigation strategy.'
29. In addition, the recent Addendums to the HRA (Wiltshire Council, May, 2018), (Wiltshire Council, September 2018) conclude that allocations at Trowbridge are within areas likely to be used by bat populations associated with the Bath and Bradford on Avon Bats SAC. The allocations are likely to contain habitat features used by these species and development could lead to their deterioration through physical loss as well as lack of or inappropriate habitat management and higher ambient light levels. These effects potentially become more significant when the effects of the plan are considered as a whole due to the potential for significant loss and deterioration at a landscape scale.
30. This document, the TBMS (Trowbridge Bat Mitigation Strategy formerly referred to as the Trowbridge Recreation Management Mitigation Strategy), sets out the mitigation measures required by the HRA and designed to ensure no adverse impact on the important bat populations associated with the Trowbridge landscape due to the HSAP (and therefore no adverse impact on the integrity of the Bath and Bradford on Avon Bats SAC).

#### 3.2.4 Windfall and neighbourhood plan sites

31. The recently published Wiltshire Housing Land Supply Statement (Wiltshire Council, March, 2018) demonstrates that there have been a series of historic windfall housing sites approved for Trowbridge within the urban area. To-date, relevant planning applications have been determined in accordance with the Wiltshire Council Bat SAC Guidance (Wiltshire Council, September, 2015) (see below) to ensure each development provides appropriate mitigation for bat populations associated with the SAC.
32. However, in terms of the mitigation required for bat populations associated with the Trowbridge landscape, the historic picture with respect to windfall developments and the potential identification of new greenfield sites through neighbourhood plans or application of rural exception policies at its surrounding villages has three main implications:
- Windfall development is expected to continue for the Trowbridge area for the foreseeable future;
  - Windfall sites have the potential to add to the cumulative pressures on the local bat populations. Greenfield development sites may contribute to both habitat and recreational pressures while pressures from brownfield housing sites are most likely to be restricted to recreational pressures alone;

- Therefore, new sites must be catered for in the mitigation to be specified within this document.

33. This strategy will therefore provide guidance for sites coming forward as rural exceptions sites under core policy 44 and through neighbourhood planning. The number of such dwellings is difficult to predict and therefore a precautionary approach must be taken towards their mitigation. While the numbers coming forward as rural exceptions can be expected to be small, relevant Neighbourhood Plans will need to be subject to bespoke assessments under the Habitats Regulations.
34. Development of commercial, employment and other non-residential schemes may also be subject to bespoke assessments. The principles established in this strategy for mitigating habitat loss will apply equally to such schemes but, depending on the nature of the scheme, their effects on recreational pressure are expected to be less significant.

### 3.2.5 Wiltshire Council Bat SAC Guidance

35. The Wiltshire Bat SAC guidance (Wiltshire Council, September, 2015) has been prepared jointly by Natural England (NE), Wiltshire Council and local experts and researchers. It is aimed at applicants, agents, consultants and planners involved in producing and assessing development proposals in the landscapes surrounding Wiltshire's most sensitive bat roosting sites which are protected by European wildlife legislation. The Wiltshire Bat SAC guidance sets out a requirement for adequate survey information, mitigation and compensation for bats in order to demonstrate that development proposals will not impact on the designated bat populations. The guidance applies to all types of development that are subject to planning control.
36. The Wiltshire Bat SAC guidance explains how development activities can affect Wiltshire's bat SACs and what must be done to avoid or mitigate any impacts. It aims to flag up the types and locations of development that present risks to the SACs so that the needs of bats can be taken into consideration as early as possible in order to avoid unnecessary delays to development projects.
37. This document must be read and interpreted alongside the Wiltshire Council Bat SAC Guidance. It has been written to complement the Guidance; **and does not supersede the policy requirements contained therein.**

### 3.2.6 Forthcoming Local Plan Review

38. Wiltshire Council has commenced the process of reviewing the Wiltshire Core Strategy adopted in January 2015 which identifies land for development for the period to 2026 (Wiltshire Council, November, 2017). The future document will be named the Wiltshire Local Plan, and will identify additional land for development to meet housing requirements for the period 2016 to 2036.
39. The Wiltshire Local Plan Review is in its early stages and no decisions have yet been made on the future locations for growth and development. However, Trowbridge may need to accommodate additional new homes in rolling forward the plan period to 2036. It will be critical that assessment of impacts on important bat populations and provision for essential mitigation measures is factored in to any future allocation of housing for Trowbridge. It is intended that the scope and direction of travel for the TBMS will evolve to set out the mitigation required for Trowbridge bat populations in association with proposals in the Wiltshire Local Plan.

### 3.2.7 The Evidence Base

40. The evidence base on which this document has been founded includes the sources listed below:

- Bat data compiled from existing ecological consultant's survey reports, which have been submitted in support of a variety of planning applications for individual developments;
- Extensive bat surveys undertaken in support of the Ashton Park planning application 15/04736/OUT, including radio-tracking of ten Bechstein's bats associated with Green Lane and Biss Woods in 2013 (Pegasus Group, August, 2017). Volume Two of the Environmental Statement includes an analysis of Bechstein's bat data for the local area compiled from a variety of sources, including historic surveys within Green Lane and Biss Wood undertaken by Wiltshire Bat Group and historic data from the Westbury Bypass planning application in 2005/06 (Aspect Ecology, August 2017);
- Shadow Habitats Regulations Assessments undertaken by DTA Ecology on behalf of Wiltshire Council relating to the Ashton Park planning application 15/04736/OUT (DTA Ecology, Oct 2016) (DTA Ecology, July, 2017);
- Habitats Regulations Assessments undertaken by Wiltshire Council of the WCS and HSAP; and of the Ashton Park planning application 15/04736/OUT (WSP, February, 2012) (WSP, March 2013) (Wiltshire Council, April 2014) (Wiltshire Council, June, 2017) (Wiltshire Council, February, 2018) (Wiltshire Council, May, 2018);
- Data obtained from the Wiltshire and Swindon Biological Records Centre (WSBRC);
- Evidence and views obtained from a small consultative group of local expert batworkers;
- Castlemead S106 Ecology Monitoring reports undertaken at Green Lane and Biss Woods in 2014, 2015, 2016 (Cohen) and 2017 (Cohen) on behalf of WWT
- Further contextual information on the key bat species in Wiltshire and the Trowbridge area taken from the Wiltshire Mammal Atlas (Harris G. L., March 2017); and
- A Footprint Ecology Report (Footprint Ecology, November 2018) was commissioned by Wiltshire Council to consider recreation pressures on the nature conservation interest of woodland near to Trowbridge. The report includes the findings from a visitor survey of the East Trowbridge woods and other Trowbridge greenspaces, including information on levels of current use of different sites, why people choose different sites and what management might work to influence and change people's access patterns. The report also presents the results from semi-structured interviews with selected stakeholders to supplement the information from the face-face survey, to understand current issues with management of the woods and opportunities. Finally, the report contains a literature review which identifies issues relating to recreation use/urban effects on woodlands, focusing on bats and also reviews particular approaches to mitigation (exclusion zones and alternative greenspace).

## 4 WHAT THIS DOCUMENT SEEKS TO DO

41. The TBMS is aimed at developers, consultants and local authority planners involved in assessing development proposals in the landscapes in and surrounding Trowbridge.
42. The overall aim is to provide a clear and detailed approach to considering impacts of development in the Trowbridge area on the Bath and Bradford on Avon Bats SAC. This will help inform strategic planning for the area's future housing needs.
43. The strategy will comprise a component of the development management process, to be considered in line with relevant policies listed above. It should be read alongside the Wiltshire Bats SAC Guidance (Wiltshire Council, September, 2015), or later revision of the same, and seen as a detailed local supplement to this document.
44. This version of the TBMS has been prepared to support the draft Wiltshire Housing Site Allocations Plan and development in accordance with Core Policies 2 and 29. It is also intended that the scope and direction of travel for this document will evolve alongside the emerging Local Plan Review.
45. It is intended that this strategy will be adopted as a Supplementary Planning Document (SPD) to help influence and provide guidance on the acceptability of development, including proposed mitigation. The National Planning Policy Framework (glossary) defines SPD as: "*Documents which add further detail to the policies in the development plan. They can be used to provide further guidance for development on specific sites, or on particular issues, such as design. Supplementary planning documents are capable of being a material consideration in planning decisions but are not part of the development plan*". Accordingly, this strategy is intended to provide further detail and guidance with respect to Core Policies 29 (Spatial Strategy: Trowbridge Community Areas) and 50 (Biodiversity and Geodiversity) within the Wiltshire Core Strategy.
46. This strategy sets out:
- spatial areas (or Bat Sensitivity Zones) where development could have an effect on the SAC and trigger the requirements of the Habitat Regulations. It is those areas to which this strategy relates.
  - survey requirements for bats that will be expected for development proposals located within the Bat Sensitivity Zones.
  - basic mitigation standards and principles that will be expected for development proposals located within the Bat Sensitivity Zones.
  - a strategy for landscape-scale, strategic mitigation required to support development proposals, covering both the impacts on bat habitat; and recreational pressures on key bat sites. Key measures are identified, together with any funding required to implement the strategic mitigation.
  - the mechanism for implementation of strategic mitigation – namely developer contributions via section 106 legal agreement or through Community Infrastructure Levy (CIL) payments.
47. This strategy is based on best practice and learning from similar areas such as North Somerset and Mendip Bats Special Areas of Conservation (SAC) guidance (North Somerset Council, January 2018) and the best scientific information available at the time of writing the strategy. It will be kept under review and has been developed with input from Natural England.

## 5 BAT ECOLOGY

### 5.1 Bat ecology – general

48. Bats have a complex life-cycle in which they rely on a network of different sites for roosting throughout the year. Hibernation and maternity roosts are the most critical, but a series of other “transitory” roosts are also used as bats move around from one area to another, using different food sources from a variety of habitats as the seasons unfold. “Swarming” sites where bats congregate for socialising and mating in the autumn (and to a lesser degree also in spring) are also vitally important for maintaining populations. The roost network used by the SAC species throughout the year can include a wide range of features including:
- Mines, shafts and adits
  - Caves
  - Culverts and tunnels
  - Buildings – particularly loft voids and cellars
  - Trees – rot holes, flaking bark, woodpecker holes
49. Foraging areas used by bats vary between species and throughout the year, and include a wide range of habitats which support their invertebrate prey. Suitable semi-natural habitats such as woodlands, mature hedgerows, grazed pasture, rough grassland, watercourses and wetlands closest to bat roosts are most likely to be important to the bat populations, particularly for juveniles, however some species are highly mobile and may forage several kilometres from their roosts on a regular basis.
50. In order to migrate between the network of summer, winter and transitory roosts, and commute to and from their numerous foraging areas, bats use established ‘commuting corridors’. Although bats are capable of crossing (and frequently do cross) large open areas, good quality connective habitats are preferred. These are generally well vegetated, sheltered linear features that provide direct routes between foraging areas and roosts. They generally provide some protection from predators; and the sheltered conditions also ensure that the bats use less energy in flight rather than flying into the wind. Such connective linear habitat includes:
- Hedgerows, stone walls and tree lines
  - Woodland edges and scrub belts
  - Riparian corridors e.g. rivers, stream, brooks, canals etc
  - Embankments and cuttings e.g. railways, roads, visibility bunds etc.
- #### 5.1.1 Impacts of lighting on bats
51. Artificial lighting is known to have severe impacts on bats, acting through a range of different mechanisms (Stone E. , 2013). Light falling on a bat roost exit point, regardless of species, will at least delay bats from emerging, which shortens the amount of time available to them for foraging. As the main peak of nocturnal insect abundance occurs at and soon after dusk, a delay in emergence means this vital time for feeding is missed. At worst, the bats may feel compelled to abandon the roost. Bats are faithful to their roosts over many years and disturbance of this sort can have a significant effect on the future of the colony.
52. In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats and their use of commuting routes. There are two aspects to this: one is the attraction that short wave length light (UV and blue light) has to a range of insects; the other is the presence of lit conditions.

53. Many night-flying species of insect are attracted to lamps that emit short wavelength component (Bruce-White, 2011). Studies have shown that, although noctules, serotines, pipistrelle and Leisler's bats, take advantage of the concentration of insects around white street lights as a source of prey, this behaviour is not true for all bat species. The slower flying, broad-winged species, such as long-eared bats, barbastelle, greater and lesser horseshoe bats and the *Myotis* species (which include Brandt's, whiskered, Daubenton's, Natterer's and Bechstein's bats) generally avoid external lights (Bat Conservation Trust, 2009).
54. This means that light that spills onto bat commuting routes or foraging areas can cause avoidance behaviour by some light-sensitive species (including greater horseshoe, lesser horseshoe and Bechstein's) and isolate or fragment habitat in the landscape (Stone E. , 2013). This will mean that bats may be forced to abandon foraging areas or commuting routes for sub-optimal habitat (which may ultimately result in abandonment of roosts if that alternative habitat is insufficient to sustain the colony). Lighting can be particularly harmful if it illuminates important foraging habitats such as river corridors, woodland edges and hedgerows used by bats. Studies have shown that continuous lighting along roads creates barriers which some bat species cannot cross (Fure A. , 2012).
55. It is also known that insects are attracted to lit areas from further afield. This could result in adjacent habitats supporting reduced numbers of insects, causing a further impact on the ability of light-avoiding bats to feed.
56. The introduction of new lighting is therefore a significant issue for greater horseshoe, lesser horseshoe and Bechstein's bats.

## 5.2 Bechstein's bat

57. The information on Bechstein's bat ecology and local distribution has been obtained from two main sources:
- Aspect Ecology (August 2017) (within Pegasus Group, Ashton Park, Trowbridge Environmental Statement Volumes 1 & 2). Report in respect of Bechstein's Bats (including results of the 2013 radio-tracking study).
  - Harris, G and Purgle, L (March 2017). Wiltshire Mammal Atlas Second Edition.

### 5.2.1 Ecology

58. A medium-sized bat, with a grey-brown dorsal surface and pale belly, the Bechstein's bat is usually easily distinguished from other species by the very long ears which extend beyond the nose when pushed forwards over the muzzle. The Bechstein's bat inhabits wooded landscapes across Europe, from southern England to central Europe and the Balkans, east to the Black Sea, Iran and the Caucasus, typically utilising broad-leaved woodlands, often with watercourses.
59. The Bechstein's bat is considered generally rare throughout its Great Britain range, sparsely distributed, and considered one of Great Britain's rarest mammals in part due to genuine scarcity but also a result of difficulties in achieving reliable surveys. In Great Britain, the species is restricted to southern England, with strongholds in southern counties, including Sussex, Hampshire and Dorset. British populations appear to favour mature deciduous woodlands with a high proportion of oak and ash species (Greenaway and Hill, 2004; Hill and Greenaway, 2008; Schofield and Mitchell-Jones, 2010), which offer a variety of natural roosting opportunities as well as providing important foraging habitat for this species; typically, larger woods are strongly favoured. However European populations also adopt beech woods and conifer woodlands where adequate under-storey is present.

60. The Bechstein's bat is difficult to differentiate from the other *Myotis* species through acoustic surveys and so trapping surveys with acoustic lures (such as the Sussex Autobat, Hill & Greenaway, 2005) are considered the most reliable survey method. This led to the national Bechstein's Bat Project, coordinated by Bat Conservation Trust, building upon the pilot studies of Dr David Hill and Frank Greenaway (Miller, 2011). In 2015 a joint postgraduate research project was launched by Exeter University and Vincent Wildlife Trust as a result of concerns over inbreeding of isolated populations (Wright, 2018). Whilst genetic diversity was found to be generally high across the species range, a differentiation was also found to exist between the northern and southern part of the Bechstein's range in the UK. The study reports that the absence of obvious physical barriers such as mountain ranges between both populations suggests that anthropogenic barriers may explain the differentiation. These two projects underpin current knowledge about Bechstein's ecology in Britain.

#### 5.2.1.1 Summer roosts

61. The Bechstein's bat typically spends the summer and breeds in roosts within woodlands, using cavities such as woodpecker holes and bat boxes. In addition, bats are rarely recorded roosting in buildings. Bechstein's bats have also been recorded roosting within hedgerow trees. Palmer et al. found such hedgerow trees to be well used even by maternity groups close to Grafton Wood where there are thought to be ample suitable potential roost cavities (Palmer, 2013). More recent studies associated with the Trowbridge woodlands and also Bere Forest in Hampshire have also found maternity colonies associated with mature trees outside of woodlands (Keith Cohen *pers com*; Tristan Norton *pers com*).

62. Maternity colonies range from 10-50 females, rarely to 100 bats, exhibiting fission-fusion societies, i.e. they subdivide and recombine frequently, changing roosting sites every few days. The frequent splitting and regrouping means that at any one time the breeding colony is split between more than one roost and an occupied roost may not contain all the members of the colony. This strategy allows Bechstein's bats to be flexible according to roost availability and suitability, colonising a number of smaller roosts, where necessary. Radio-tracking studies have recorded Bechstein's bats switching roosts every 2-3 days (Schofield and Morris, 2000), and a single maternity colony can use up to 50 different roosts within a maternity season (Kerth and Reckardt, 2003). Male Bechstein's bats typically roost individually or travel to different maternity roosts every year (Greenaway and Hill, 2004).

63. At a landscape scale, the location of roost sites appears to be broadly dictated by distance to individual foraging sites (see below). Bechstein's bats show strong fidelity to individual foraging areas, returning to the same sites on consecutive nights and even years regardless of roosting location (Kerth et al., 2001a) and as such, roosting sites are often located in close proximity to foraging habitat, minimising travel distance and therefore reducing the energetic cost of commuting between roosts and foraging areas (*ibid.*)

#### 5.2.1.2 Summer home range and foraging behaviour

64. Bechstein's bats have been recorded foraging mainly in deciduous woodland with a closed canopy (Schofield and Morris, 2000; Fitzsimons et al., 2002; BCT, 2011). Preferred woodland foraging habitats used by Bechstein's include those with a predominance of oak and ash in the woodland canopy, a dense understory with a predominance of native species (including hazel and hawthorn and large areas of contiguous woodland (either in one block or several smaller connected areas), of at least 25ha (BCT, 2011). This estimate of 25ha as a minimum viable range has been taken from this model which assumed a minimum viable population of 25 breeding females each requiring 1ha of foraging territory

65. A number of studies have also recorded foraging sites to be located within woodland in close proximity (up to 1 km) of water (Schofield and Morris, 2000; Fitzsimons et al., 2002, BCT, 2011). Bats

have also been shown to use overgrown hedgerows and tree lines for foraging (Schofield and Mitchell-Jones, 2010). Recent radio-tracking studies at the Forest of Bere in Hampshire found that bats were also regularly foraging over grazed pasture and within conifer plantations (Tristan Norton, *pers com*). That Bechstein's bats forage beyond the confines of the roost woodland, utilising the wider landscape, has been replicated by a number of recent radio tracking studies (e.g. Palmer et al., 2013).

66. In order to exploit all of the foraging resources available, Bechstein's bats forage throughout the vertical strata of the woodland or mature tree line, from close to the ground to high up in the canopy, catching insect prey both during flight (aerial hawking) and through gleaning invertebrates from the surface of vegetation (Schofield and Morris, 2000; Altringham, 2003; Dietz et al., 2007; Schofield and Mitchell-Jones, 2010). The diet of Bechstein's bats changes throughout the season according to prey availability, whilst faecal analysis has recorded evidence of moths, beetles, crane flies, grasshoppers, dung flies, lacewings and non-flying arthropods such as spiders (Wolz, 1993, referenced in Kerth et al., 2001a; Altringham, 2003; Dietz et al., 2007). The presence of dung flies in the diet of Bechstein's bat also lends weight to the use of grazed pasture (potentially in a parkland setting) by foraging Bechstein's bat (Tristan Norton, *pers com*).
67. Individual Bechstein's bats typically forage within their own distinct core foraging territories, separate from those of neighbouring bats (Kerth et al., 2001a; Greenaway and Hill, 2004). As a result, some Bechstein's bats will travel greater distances from the same roost, through areas of suitable foraging habitat, in order to reach their own individual core foraging site. Studies have thus recorded bats travelling on average between 0.5km and 1.5km from roosts to foraging sites, although distances of up to 4km have been recorded in some instances (Steinhauser, 2002; Boye and Dietz, 2005) and by bats radio tracked as part of the monitoring study undertaken for the Castlemead development at Trowbridge (Cohen, Castlemead s.106 Ecology Monitoring Report: Green Lane & Biss Woods 2016, 2017)
68. Research on foraging Bechstein's bats in the UK has recorded a range of different core foraging ranges, from 0.08ha in a 156ha deciduous woodland in Sussex up to 103.27ha in Worcestershire (Fitzsimons et al., 2002; Palmer et al., 2013). Studies in extensive deciduous woodlands in Europe, which may represent optimum habitat conditions, have recorded smaller territory sizes of approximately 20 ha (Kerth et al., 2001a).

#### 5.2.1.3 Flightlines

69. Studies in Sussex (Greenaway and Hill, 2004; Hill and Greenaway, 2006) reported that female Bechstein's bats generally stay under the canopy of woodland and dense hedgerows when commuting and foraging, which is consistent with the behaviour of other bat species (Entwistle et al., 1996; Brandt et al., 2007). However, radio-tracking studies in Dorset (Schofield and Morris, 2000), the Isle of Wight (Ian Davidson-Watts, *pers.comm.*), and Worcestershire (James Hitchcock / Eric Palmer, *pers. comm.*) have reported observations of bats moving directly across open fields or farmland when travelling from, or returning to, roost sites and foraging areas
70. In addition, a number of studies in the UK have recorded Bechstein's bats crossing roads, including the A422 in Worcestershire (Palmer et al., 2013). Radio-tracking studies undertaken in woodlands in the vicinity of Trowbridge, including Green Lane Wood and Biss Wood, have recorded bats crossing the A350 (Laurence, 2003; Laurence, 2007, Aspect Ecology, August 2017, Annex 4). Although Bechstein's bats have been recorded crossing roads, there is evidence that for larger roads, such as motorways there may be a barrier effect (Kerth and Melber, 2009). In the vicinity of such roads, it is likely the retention of cluttered habitat is particularly important, to maintain habitat linkages.



#### 5.2.1.4 Hibernation roosts

71. During winter in the UK, a small number of Bechstein's bats have been recorded hibernating in caves and mines. However, hibernating Bechstein's bats are rarely observed within the SAC mines, and it is unclear if these mines are a main hibernation site for them, although some individuals are likely to be hidden from view in narrow and inaccessible crevices. It is thought that Bechstein's bat is likely to utilise both underground sites (mines, caves, etc.) and woodland hibernation sites, such as deep holes or cavities within deciduous trees, and thus may remain in the breeding woodlands all year round.

#### 5.2.1.5 Autumn swarming

72. In autumn, Bechstein's bats travel to swarming sites (which may be located some distance from their habitual summer foraging areas). There is evidence to suggest that swarming behaviour is a mating event (Kerth et al., 2002), where bats will chase one another, particularly at cave or mine entrances which are known hibernation sites for the species. The reason for swarming behaviour in bats is not fully understood. However, theories include social learning (i.e. swarming behaviour teaches juveniles to become familiar with suitable winter roost sites); and increasing genetic diversity (i.e. congregation of bats at autumn swarming increases the number of potential mates, which provides opportunities for genetic mixing between populations). Bechstein's bats tagged at swarming have been recorded returning to their maternity sites at the end of the night, rather than being temporarily resident near / at the underground sites. (Dekeukeleire, 2016 )

#### 5.2.2 Local context

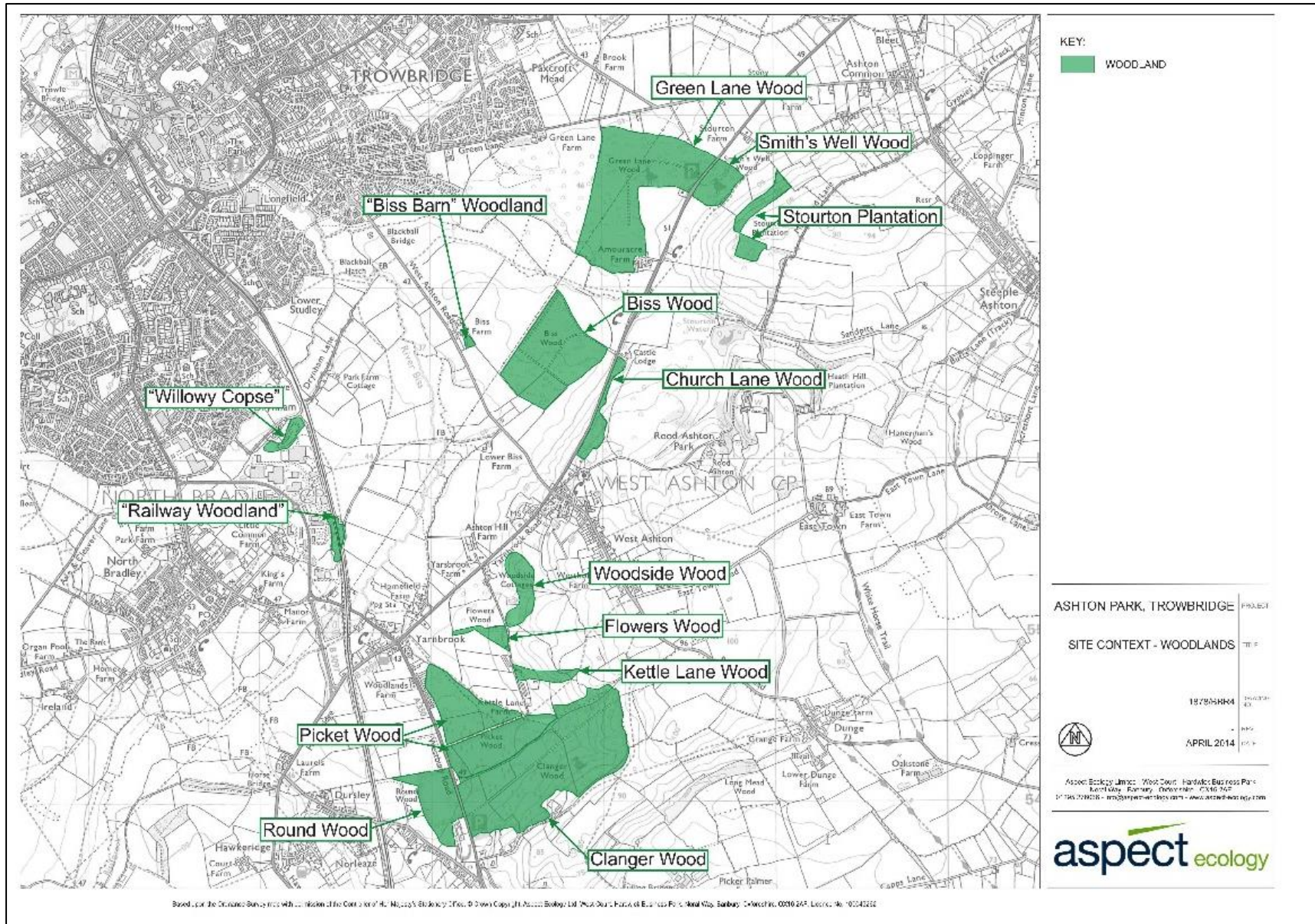
73. Significant records of Bechstein's bat within Wiltshire include a significant number of hibernating bats within a series of caves and mines in the West of Wiltshire located approximately 8 - 12km from Trowbridge (JNCC, 2011). These caves also support large numbers of hibernating greater horseshoe and lesser horseshoe bats and as such have been designated as the Bath and Bradford-on-Avon Bats SAC. Hibernating Bechstein's have also been recorded in Chilmark Quarries SAC.
74. Box Mine SSSI (a component site of the Bath and Bradford on Avon Bats SAC) is also an important site for swarming Bechstein's which is likely to be frequented by bats whose core ranges are a considerable distance from the site. Bechstein's bats are regularly recorded during autumn swarming trapping surveys at a range of stone mines within the Bath & Bradford-on-Avon Bat SAC (40 records amounting to a total of 184 individual Bechstein's bats trapped and ringed during this time). Whilst the swarming function is not a qualifying feature of the SAC, it is nonetheless a vital element of the ecology of Bechstein's bat.
75. Ringing records obtained from Dr Danielle Linton have confirmed links between bats swarming at Box Mine and three additional sites in Wiltshire (the maternity colonies at Green Lane and Biss Woods, Trowbridge; and a roost at Drews Pond Wood Local Nature Reserve (LNR), Devizes). These ringing records confirm a functional link between the Bechstein's bat roosts in Green Lane and Biss Wood and the Bath and Bradford on Avon Bats SAC; and it is therefore inferred that Bechstein's bats annually migrate between the SAC and other hibernation and breeding sites that constitute the wider SAC network. Other swarming sites such as Gripwood, that are not part of the SAC, are also recorded as being visited by ringed Bechstein's bats from Green Lane and Biss Woods (Linton / Cohen pers. comm.); individual populations of swarming bats of other species have been found to have high fidelity to individual swarming sites and as such each site has value to a distinct bat population (Dekeukeleire, 2016 ).
76. Wiltshire has seen extensive study in recent years on Bechstein's bats, focused in particular upon the breeding populations at Trowbridge, particularly the long-term studies at Green Lane Wood and Biss

Wood, following their discovery here in 1999. A summary of the known habitat use and behaviour of the Bechstein's bat population in the Trowbridge area is provided below, mostly taken from the Aspect Ecology Environmental Statement (amended in 2017) (Pegasus Group, August, 2017):

- A number of tree roosts (most commonly woodpecker holes and rot holes) and bat box roosts have been recorded during radio tracking studies. The majority of these were located within woodland blocks, however, some day roosts were recorded outside the main woodlands, the most notable of which comprised a hedgerow tree located some 500m north of Green Lane Wood (with 100+ bats recorded emerging in 2016) ((Cohen, Castlemead s.106 Ecology Monitoring Report: Green Lane & Biss Woods 2016, 2017)
- Based on the observed regular use of roosts, together with the recorded ranging distances of individual bats and the flight behaviour of radio tracked bats, it is considered likely that the Bechstein's bats in the local area belong to several 'sub-colonies' associated with particular woodlands, namely Green Lane Wood-Stourton Plantation; Biss Wood; Church Lane; Woodside Wood; Clanger Wood; Round Wood; and Picket Wood (see Figure 3 below);
- The sub-colonies appeared to form relatively distinct female maternity groups. However, low levels of sub-colony mixing were recorded, with individuals recorded to move between various woodlands during the 2013 radio-tracking study and from previous survey work undertaken by other parties (as reported in Aspect Ecology (August 2017) e.g. Laurence, 2003; Laurence, 2004; Billington, 2006; Laurence, 2007). On this basis, all of the sub-colonies are considered likely to form one large and semi-linked meta-population across the local area. It is possible that further sub-colonies which form part of the larger meta-population may be discovered with further research work. For example, radio tracking by the Wiltshire Bat Group during the period 2003 to 2006 also found Bechstein's tree roosts at Kennel Wood, wooded copses associated with Rood Ashton Manor and near East Town;
- The recorded summer home ranges for radio tracked bats in the Trowbridge landscape in 2013 are particularly large in comparison to those reported in other radio-tracking studies in Worcestershire, Sussex and Dorset (recorded as an average of 150 ha, although ranging from 35 to 445 ha for individual bats) (Fitzsimons et al., 2002; Palmer et al., 2013). Further, the size of core foraging and feeding ground range was also recorded to be markedly higher, averaging 6.18ha and 55.52ha, respectively. Bats will only utilise as much habitat as is necessary to meet their foraging needs; and the larger summer ranges recorded for this population are likely to be due to the fragmented and sub-optimal nature of the wooded landscape, forcing bats to expand their summer home and foraging ranges in order to meet their foraging needs;
- The majority of foraging was recorded within and immediately adjacent to woodlands in the local area. However, the radio tracked bats were also recorded to make use of non-woodland habitats for foraging in the form of the River Biss corridor and occasionally hedgerows, varying in structure and composition, ranging from relatively dense outgrown hedgerows to box-cut hedges; two bats also foraged over cattle in farm sheds. Two bats radio tracked in 2016 travelled as far north as the Kennet and Avon Canal and spent time foraging along the canal (Cohen, Castlemead s.106 Ecology Monitoring Report: Green Lane & Biss Woods 2016, 2017)
- The results of the radio-tracking study undertaken in 2013 indicate overlap in core foraging areas, between several bats. There is research evidence to suggest that there is a direct link between relatedness and the level of overlap of core foraging areas, indicating maternal inheritance of core foraging areas (Kerth et al., 2001a). On this basis, the considerable overlap in core foraging areas recorded, could indicate relatedness between the bats concerned. However, overlapping home ranges could also be an indication of the limitations of local foraging habitats;

- In 2013, relatively high-level foraging use of 'Willow Copse' (a young deciduous plantation woodland, likely to have originated from the 1980s) was made by one radio tracked bat. Similar use of a young plantation sycamore copse to the north west of East Town was recorded by a female Bechstein's bat radio tracked in September 2003 by Wiltshire Bat Group. The level of use made of such young plantation woodland raises the possibility that Bechstein's bats can gain significant sustenance from such small young new woodlands, a finding which could have important benefits for the maintenance and enhancement of this species at this site and across its range;
- Radio tracked Bechstein's bats in 2013 were recorded as using a range of (predominantly linear) habitat features for commuting, including the River Biss corridor, hedgerows, tree lines, woodland edges and the railway line. All linear features comprised dark unlit corridors. The linear features are likely to be important to provide connectivity between areas of optimal woodland habitat, such that the Bechstein's bats are likely to utilise these linear features out of necessity to maintain sufficient summer home ranges and to access the optimal roosting and foraging habitat available;
- All ten radio tracked Bechstein's bats in 2013 were recorded to cross roads, including the A350. The majority of individuals in this study were recorded to commute along linear features, in the form of hedgerows and tree lines, leading up to the A350. As well as crossing the unlit A350, Bechstein's bats were recorded to cross Bratton Road in West Ashton, lit by orange, low pressure sodium lights. In 2016 and 2017, bats were regularly recorded crossing Ashton Road adjacent to the junction with Green Lane, and in 2016 two bats also crossed the A361 east of Trowbridge (Cohen, Castlemead s.106 Ecology Monitoring Report: Green Lane & Biss Woods 2016, 2017)
- Radio tracking studies have shown foraging and night-roost use of parkland and hedgerow trees, mainly mature oaks, within fields near to the core woods (<1km) (Cohen, Castlemead s.106 Ecology Monitoring Report: Green Lane & Biss Woods 2017, 2018) (Cohen, Castlemead s.106 Ecology Monitoring Report: Green Lane & Biss Woods 2016, 2017) Similar observations have been recorded by other recent radio tracking studies e.g. at Grafton Wood (Palmer, 2013)

Figure 3 Woodland habitat utilised by the local Bechstein's 'meta-population', reproduced from (Aspect Ecology, August 2017)



## 5.3 Greater horseshoe bat

### 5.3.1 Ecology

77. The following information on greater horseshoe bat ecology and local distribution has been obtained from two main sources:

- Harris, G and Purgle, L (March 2017). Wiltshire Mammal Atlas Second Edition; and
- North Somerset Council (January 2018). North Somerset and Mendip Bats Special Area of Conservation (SAC) Guidance on Development: Supplementary Planning Document

78. The horseshoe bats can be distinguished from other British bats by the 'noseleaf', which is thought to act as an 'acoustic lens', focusing echolocation pulses that are emitted from the nose. The greater horseshoe bat is the largest European horseshoe species. When roosting, they hang free with the wings enfolding their body, resembling small pears. They are long-lived animals and individuals have been known to live for up to 30 years. Greater horseshoe bats were originally cave dwellers, but most maternity colonies today are in buildings, choosing sites with large entrance holes which the bats can fly through with access to open roof spaces warmed by the sun. Greater horseshoe bats require a number of night roosts in the landscape near to the maternity roost (usually up to 4 km, but exceptionally up to 14 km) for resting between foraging bouts.

79. In winter, the greater horseshoe bat uses a series of caves, disused mines, cellars and tunnels as hibernation sites. These sites can be some distance from the breeding roost (> 50 km). Hibernation is interrupted between once a day and once every 6-10 days (depending on the temperature and time of year) to feed near the cave entrance or change roost site. Transitional roosts used during the spring and autumn are important staging posts for the population moving between breeding and hibernation roosts.

80. Greater horseshoe bats require a diverse habitat mosaic, including:

- **grazed pastures** are critical foraging habitat for greater horseshoes. Cattle are preferred to smaller grazers, since they create the ideal structural conditions for perch-hunting bats in hedgerows and woodland edge. Large dung beetles, *Geotrupes* spp., can provide a major dietary component of greater horseshoe bats. Most favour cattle dung, but some also use sheep dung; and *Aphodius* dung beetles live in cow, sheep and horse dung. Short grazed habitat, such as produced by sheep, also benefits *Melontha* and *Tupilid* species which require short grass to oviposit. Within 1 kilometre of the roost the presence of permanent grazed pasture is critical for juvenile greater horseshoe bats. A high density of grazing animals should be present giving high presence of dung.
- **mature semi-natural woodlands** including riparian woodland. Rides and footpaths are used by greater horseshoe bats when flying in woodland feeding areas. Grassy rides and glades in woodland increase the range of food and provide opportunity for perch hunting. Woodland supports high levels of moth abundances. Macro (and micro) moths are densest where there is grass or litter, less so where there are ferns, moss, bare ground or herbs. They are richer where there is native tree diversity and trees with larger basal areas. Species such as oak, willow and birch have large numbers of moths, whereas beech has small numbers even when compared to non-native species such as sycamore. Uniform stands of trees are poorer in invertebrates than more diversely structured woodland.
- **other grasslands**, including meadows kept for hay and silage; and flower-rich grasslands on road verges, grassy embankments and brownfield sites. Longer swards benefit the larvae of noctuid moths, for example, the main moth species eaten by greater horseshoe bats associated with the maternity roost at Woodchester Mansion, Gloucestershire are all species

associated with grassland habitats, including large yellow underwing, small yellow underwing, heart and dart and dark arches (Ransome, 1997);

- **scrub**, for example, Billington (Billington G. , 2000) recorded frequent foraging use of scrub habitat, particularly Buddleia scrub within disused quarries, during radio tracking carried out for the Mells Valley SAC in June. However, large areas of continuous scrub are likely to be avoided by greater horseshoe bats.
- **well-developed hedgerows or lines of trees**. Larger hedgerows are required for commuting as well as foraging. Substantial broad hedgerows with frequent emergent trees can provide suitable structure for foraging conditions for greater horseshoe bats if woodland is scarce; and
- **watercourses**. Tipulid larval development is favoured by damp conditions. Therefore, any aquatic environments and/or marshes can provide a secondary prey source. Aquatic environments could also favour the production of caddis flies in certain months, such as May and late August / September when other food supplies may be erratic. There is significant caddis fly consumption at roosts close to extensive river or lake habitats (Ransome, 1997). Extensive use of the Bristol Avon by greater horseshoes was recorded during radio tracking in the Bradford on Avon area (Fiona Mathews, pers. com.); and in Devon the River Dart, a large river system, mostly banked by broadleaved woodland was also found to be a key habitat (Billington G. , 2003).

81. These habitats are not used consistently throughout the year but change with the seasons. Woodlands and pasture adjoining wood are used in spring and early summer. As summer progresses, feeding switches to areas further away and tends to be fields used for grazing cattle and other types of stock. Meadows that have been cut and where animals are grazing are also used. A balance of woodland and pasture of about 50% and 50% provides optimum resources for greater horseshoe bats.
82. Dietary analysis of greater horseshoe bat droppings shows that this species is conservative in its food sources and there are three main prey items: cockchafer *Melolontha melolontha*; dung beetles *Aphodius* sp. (Coleoptera: Scarabaeidae); and moths (Lepidoptera). Of these moths form the largest part of the diet but the other two are important at certain times of year. Three secondary prey sources are also exploited: crane flies (Diptera: Tipulidae), ichneumonids (Hymenoptera: Ichneumonidae) of the *Ophion luteus* complex, and caddis flies (Trichoptera)
83. The preferred key prey in April for all bats that have survived the previous winter is the large dung beetle *Geotrupes*. In May, the preferred key prey is the cockchafer *Melolontha melolontha*. In June and early July, pregnant females feed on moths, their key prey at that time, and continue to do so after giving birth, until late August. Moth supplies usually fall steadily in August and September, due to phonological population declines, or rapidly at a particular dawn or dusk due to temporary low temperatures. If either happens, adult bats switch to secondary, single prey items, or combine moths with them. In very cold spells ichneumonids, of the *Ophion luteus* complex are consumed. They are common prey in October and through the winter as they can fly at low ambient temperatures.
84. Juvenile bats do not feed at all until they are about 29 or 30 days old, when they normally feed on *Aphodius rufipes*, which is their key prey. This dung beetle species is a fairly small (90mg), easily-caught and usually abundant prey, which reaches peak numbers at the time that the young normally start to feed in early August.
85. Favoured prey is caught on the wing or by gleaning prey from the surface of vegetation; flight is typically slow and often low above the ground. Greater horseshoe bats also frequently use a 'sit and wait' tactic whilst hanging from twigs and small branches within the vegetation, 'watching' from a regular perch and flying out to take passing insects.

### 5.3.2 Local context

86. The following information has been taken from Mammals in Wiltshire, Second Edition (Harris G. L., March 2017) with supplementary local contextual information added where appropriate.
87. Only two maternity roosts are currently confirmed in Wiltshire at the time of writing (September, 2018): one in Box Mine SSSI and the other at a residential property in Westbury Leigh. Note that Iford Manor SSSI lies adjacent to the county boundary, just outside Wiltshire – this is one of the largest maternity colonies in Great Britain.
88. During 1996-2016 over 4100 records of greater horseshoe bats had been submitted, of which over 3500 records relate to hibernation counts at Bath and Bradford-On-Avon Bats SAC and a lesser number at Chilmark Quarries SAC. Ongoing hibernation counts at sites within, and associated with, the Bath and Bradford-on-Avon SAC, coordinated by Dr Fiona Mathews and Wiltshire Bat Group, have confirmed that these sites continue to support significant numbers of greater horseshoe bats, and furthermore, ringing studies are now providing an insight into how individuals move regularly between sites during the winter. An approximate total of 19 separate hibernation sites (the large Box Mine complex has been treated as a single site) are represented in the records. Low numbers have been captured at some of these hibernation sites during autumn swarming surveys indicating that they are also used as mating and/or transitional roosts. Box Mine SSSI is also subject to more detailed monitoring, formerly by Ian Davidson-Watts, latterly by Roger Martindale, whose more extensive surveys of the complex yield higher counts at this location. Sites monitored in the Bath and Bradford-on-Avon SAC offer a 10-year peak mean of 414 greater horseshoe bats, with Box Mine SSSI supporting the majority of these. Peaks between winters and sites vary according to weather conditions and disturbance, with Box Mine alone ranging from 6 to 629 bats recorded during the period 2005/06 to 2015/16. More detailed analyses are required so these figures are provisional.

## 5.4 Lesser horseshoe bat

### 5.4.1 Ecology

89. The lesser horseshoe bat is the smallest European horseshoe species and when roosting they hang free with the wings enfolding their body, resembling small plums. Lesser horseshoe bats mainly roost in buildings that allow uninterrupted flight access during the summer months, often with stone walls and slate roofs. Maternity roosts are typically associated with buildings that offer a range of microclimates (e.g. attics, cellars and chimneys), thus allowing bats to shift location depending on the external temperature. Lesser horseshoe bats hibernate during the winter in underground caves, mines and cellars, which are humid and range between 4-12 degrees Centigrade. Hibernation roosts are typically within 5km of the maternity roost (maximum known distance 32km away).
90. Lesser horseshoe bats are specialised for foraging in cluttered environments, particularly woodlands, wooded riparian corridors, and mature treelines and hedgerows, feeding within or below the canopy, mainly taking small flying insects including diptera (flies including midges, gnats and dung flies), tipulids (crane flies) and lepidoptera (moths). Landscapes which are of most importance for lesser horseshoe contain a high proportion of woodland, parkland and grazed pasture, linked with linear features, such as overgrown hedgerows.
91. Woodland, particularly broad-leaved woodland, comprises the most important foraging habitat for lesser horseshoe bat. However, radio tracking research (Cresswell Associates, 2004) shows lesser horseshoe will forage over pasture, but cattle must be actively grazing the field. Once cattle are removed from a field foraging by lesser horseshoe bats ceases immediately. However, pasture in such use offers a valuable and predictable food source at a time of year when bats are

energetically stressed (pre- to post-weaning), because they are feeding their young. Scatophagidae (dung flies) can be one of the major prey categories in the diet of lesser horseshoe bats; and the larvae of the yellow dung-fly *Scatophaga stercoraria* develop in cattle dung. The presence of pasture is also indispensable to the larval stage of development for certain species (Tipulids), which form a significant proportion of the prey hunted by lesser horseshoe bats.

92. Lesser horseshoe bats fly an average of 2km per night from roosts during the summer. Band widths for foraging lesser horseshoe bats during the summer are derived from radio tracking studies. Knight (Knight T. , 2006) found that the maximum distance travelled in one night in a lowland area in North Somerset was 4.1km for an adult female and 4.5km for a nulliparous female. The mean maximum range was 2.2km. Bontadina et al (Bontadina, 2002) found a similar maximum foraging range; and recommended that conservation management should be concentrated within 2.5km of the roost with special consideration within 600 metres of the roost where the colony foraged half the time.
93. Lesser horseshoes exhibit multi-modal behaviour and fly for just over 50% of the night, resting after each foraging bout in night roosts, which appear fundamental to the conservation of lesser horseshoe bats, particularly during pregnancy and lactation (Knight T. , 2006).

#### 5.4.2 Local context

94. The following information has been taken from Mammals in Wiltshire, Second Edition (Harris and Linham, 2017) with supplementary local contextual information added where appropriate.
95. During 1996-2016 a total of 925 records of lesser horseshoe bats had been submitted, of which 186 relate to hibernation counts at sites within the Bath and Bradford-On-Avon Bats SAC and 23 at Chilmark Quarries SAC. Ongoing hibernation counts continue at sites within, and associated with, the Bath and Bradford-on-Avon SAC, coordinated by Dr Fiona Mathews and Wiltshire Bat Group. Of the records from the Bath and Bradford-on-Avon Bats SAC, Box Mine SSSI supports significant numbers of hibernating lesser horseshoe, with hundreds of bats regularly recorded. Several other disused limestone quarry hibernation sites feature in the records in the vicinity of the Bath and Bradford on Avon Bats SAC.
96. Forty-eight of the recorded roosts within Wiltshire comprised maternity roosts of which several were in the area around Bradford-on-Avon, Corsham and Trowbridge (thereby close to known hibernation sites).



## 6 BAT SURVEY REQUIREMENTS FOR DEVELOPMENT

97. The Wiltshire Council Bat SAC Guidelines (2015) set out general requirements for bat surveys in association with development and these should also be referred to. A series of additional survey requirements that must be adhered to within the area covered by this Strategy have been set out below.

### 6.1 General survey requirements

98. Early support and engagement with ecological consultees (including Wiltshire Council and Natural England) is critical to ensure that survey and mitigation scope are adequate. Use of the Council's pre-application service is recommended.

99. Within all Bat Sensitivity Zones (see Section 7 below), a licensed bat ecologist should be commissioned to carry out a preliminary visit and desk study to assess the risk and the need and scope of further survey work. **NB note that development of new sites in the Red Bat Sensitivity Zone is unlikely to be acceptable due to high impacts on the bat SAC populations – see Section 7 below.**

100. All bat survey work should be undertaken in accordance with the BCT Bat Surveys: Good Practice Guidelines. (Bat Conservation Trust, 2016).

101. Bat surveys are seasonally constrained. A substantial suite of surveys may take up to 12 months to complete and should therefore be programmed into the project delivery plan at an early stage to avoid delays.

102. Mating sites are often overlooked. A single bat in a roost is often considered to be of low conservation value, but actually could be essential to the favourable conservation status of the population if it is a male. Surveys in April and October can be critical to establishing whether the roost is a mating site and it may be necessary to trap bats to establish gender.

### 6.2 Lighting survey

103. Some of the technical information in this section has been reproduced with the kind permission of Bath and North East Somerset Council from their Waterways Design Guidance Protecting Bats in Waterside Development (Bath and North East Somerset Council, 2018).

104. In addition to the guidance set out in this section, it is expected that the approach to lighting for new development, including lighting survey, is undertaken in accordance with the guidance in (Bat Conservation Trust and Institution of Lighting Professionals, 2018) and (Gazaryan, S., and Meyer-Cords, T. (Eds) ( 2018).

105. The introduction of new lighting can result in adverse impacts to populations of Bechstein's, greater horseshoe and lesser horseshoe bat. It is therefore critical to maintain functional dark foraging habitats and commuting corridors for these species. In order to achieve this alongside new development, it will be essential that the bats and lighting issue is acknowledged and integrated into the design process from the outset, and in an iterative way. It should not be left to later design stages or be retrofitted into development proposals. In order to demonstrate that the development has been designed to accommodate light-sensitive bats, it will be necessary to provide the baseline lighting survey and modelling information set out below.

106. Early consultation with Wiltshire Council is required to establish the need for surveys of existing light levels on the proposed development site, however, it is anticipated that baseline lighting surveys will

be required for all allocated sites within the Housing Sites Allocation Plan. An understanding of baseline illuminance levels will allow accurate comparisons to be undertaken during post development monitoring and compliance checks.

107. Where baseline lighting surveys are confirmed to be required in consultation with the Council, they must be undertaken by a suitably experienced and competent lighting professional (member of the Chartered Institution of Building Services Engineers (CIBSE), Society of Light and Lighting (SLL), Institution of Lighting Professionals (ILP) or similar). The lighting professional should determine the appropriate number and location for sample readings to be taken, taking into account the habitats of value to bats on site and the potential need for the samples to be repeated post-development as closely as possible.
108. Baseline measurements should be taken systematically across the site or features in question. That is, they will need to be repeated at intervals to sample across the site or feature, either in a grid or linear transect as appropriate. At each sample location, a reading should be taken at ground level on the horizontal plane (to give illuminance hitting the ground). Vertical readings should also be taken at each sample location at 1.5m (to replicate the height at which horseshoe bats will typically fly); and at 4m (to replicate the height at which Bechstein's bats will typically fly). The orientation for vertical readings should be perpendicular to the surface/edge of the habitat feature in question (such as a wall or hedgerow) in order to produce a 'worst case' reading. Further measurements at other orientations may prove beneficial in capturing influence of all luminaires in proximity to the feature or principal directions of flight used by bats. This should be discussed in pre-application discussions with Wiltshire Council.
109. An appropriately high-quality light meter must be used which is V-Lambda and Cosine Corrected and the type of light meter used for the survey must be specified in a baseline survey report (e.g. Minolta T10). Measurements should always be taken in the absence of moonlight, either on nights of a new moon or heavy cloud to avoid artificially raising the baseline. Baseline surveys must be undertaken with all existing luminaires switched on and undimmed, and where possible, with all internal lighting switched on and with blinds or screens over windows removed. Where possible, measurements should be taken during the spring and summer when vegetation is mostly in leaf, in order to accurately represent the baseline during the principal active season for bats and again to avoid artificially raising the baseline.
110. A horizontal illuminance contour plan (isolux plot) should be prepared by the lighting professional, plotted at ground level. Vertical illuminance contour plots for 1.5m above ground level and at 4m above ground level, or similar graphic representations of illuminance levels showing light spill on vertical planes, will also need to be submitted with the planning application. Each contour plan should be accompanied by a table showing their minimum and maximum lux values.

### 6.3 Surveys aimed at horseshoe bats

111. Following the initial site visit and desk study by a licensed bat ecologist (see 6.1 above), early consultation with Wiltshire Council is recommended to confirm the need for, and scope of, surveys aimed at horseshoe bats. Horseshoe bat surveys are likely to be required for any development of greenfield sites within the yellow bat sensitivity zones, including all proposed allocations within the Housing Sites Allocation Plan. Where required, horseshoe surveys should be undertaken in accordance with the specifications listed below.
112. All surveys aimed at horseshoe bats must be designed and undertaken by a qualified ecological consultant (employed by the developer) with experience of greater and lesser horseshoe survey and

mitigation. A suitably experienced and licensed bat ecologist must produce and sign off the final bat report to be submitted with the planning application.

113. It is expected that all potential roost structures for horseshoe bats will be subject to visual inspections and dusk emergence/ dawn re-entry surveys in accordance with the BCT Bat Surveys: Good Practice Guidelines. (Bat Conservation Trust, 2016).
114. As a minimum, extensive static detector surveys in any of the yellow or red Bat Sensitivity zones identified in Section 7 below, will be required. The intensive survey effort and broadband surveying technique have been adopted to ensure that greater and lesser horseshoe bat will be detected (if present) (both species are more difficult to detect compared to most other British bat species due to the directionality and rapid attenuation of their echolocation calls). The primary objective of these surveys will be to detect commuting routes and foraging areas rather than roosts. Enough static detectors need to be deployed to monitor all potential flyways (particularly linear habitat features) but also to sample all habitats within the development site, including open grasslands, woodland edge, woodland canopy, woodland shrub layer etc. The period of deployment at each location will be at least 50 days from April to October and will include at least one working week in each of the months of April, May, June, July, August, September and October (50 nights out of 214 ≈25%).
115. As a minimum, manual transect surveys in any of the Bat Sensitivity Zones will require: manual transect surveys to be carried out on ten separate evenings. At least one survey will be undertaken in each month from April to October, as the bat's movements vary through the year. Transects will cover all habitats likely to be affected by the proposed development, including a proportion away from commuting features in field.

#### 6.4 Surveys aimed at Bechstein's bat

116. Bechstein's bats are associated most frequently with tree roosts. The local population has been shown to use trees outside the main woodland blocks for day and night roosting, as well as foraging, including a hedgerow tree that supports the largest recorded emergence count for any of the known maternity roosts. A number of tree roosts used by Bechstein's bats in the UK have also been found in small trees with a DBH (diameter at breast height) as low as 13cm (Andrews Ecology Ltd, 2017).
117. As such, all planning applications for development affecting trees within the bat sensitivity zones, either through direct loss or via indirect impacts such as lighting or fragmentation, must be supported by comprehensive bat tree surveys aimed at establishing the presence and conservation significance of tree roosts. In the first instance, this must comprise a thorough ground-based assessment, undertaken by a suitably experienced bat ecologist, to categorise any trees with potential to support roosting bats. Any such trees must then be subject to climbing survey by an appropriately licensed bat ecologist. Further emergence and re-entry surveys of affected trees may be required, and early consultation with Wiltshire Council is advised to agree the full scope of tree surveys. **Wherever possible, trees in the early mature phase or older should be retained within the dark habitat network for bats regardless of whether they contain potential roost features as it is important to retain continuity of the future roosting resource, as well as foraging resource.**
118. The Bechstein's bat is difficult to differentiate from the other Myotis species through acoustic surveys. In addition, the bat echolocates very quietly, frequently from high in the canopy, and can often be missed during acoustic surveys. This means that standard acoustic survey techniques are **not** adequate to detect the likely presence or absence of this species from a development site.

119. Survey techniques for Bechstein's bat typically involve trapping surveys (using mist nets and harp traps) with acoustic lures. Further advanced survey techniques such as radio tracking may also be deployed to assess which habitat features in the landscape are used for foraging and commuting. However, due to the low density of this species and lack of experience of many bat ecologists in capturing it, unsuccessful surveys cannot on their own be interpreted as meaning this species is absent. In addition, advanced survey techniques such as trapping and radio tracking can be time-consuming and expensive; may require a project licence from Natural England; and also need to be deployed with care to avoid the excessive disturbance to local bat populations that could arise from trapping for multiple projects.
120. Trapping and radio tracking of Bechstein's bats associated with the Trowbridge woods have been undertaken and coordinated at a strategic level for a number of years. These surveys have yielded a wealth of information about important roost sites, foraging areas and commuting routes used by the local population. It is intended that these surveys will continue in future years and be supplemented by funding through this strategy in order to build on this baseline. Given the limitations of relying on individual site surveys, this strategic approach is likely to be more cost-effective to developing a baseline of Bechstein's presence and behaviour across the Trowbridge area.
121. The bat sensitivity zones described in Section 7 below have been developed based on existing survey information and current scientific knowledge about the species to denote those areas where habitat is of importance, or is highly likely to be of importance for Bechstein's bat. It should be assumed that Bechstein's bat will be present in all red and yellow sensitivity zones and making use of all potential habitat features. Taking this into account, as well as the strategic surveys discussed above, it may not be necessary for specific surveys for Bechstein's bat to be undertaken in support of individual planning applications for development.
122. However, it is recommended that early consultation is undertaken with Wiltshire Council ecologists to confirm whether advanced survey techniques for Bechstein's bat are required to support a planning application. In situations where Wiltshire Council deem that Bechstein's surveys are nevertheless required, the survey methodology must be agreed with Wiltshire Council in advance (e.g. suitably competent staff, trapping dates, trap numbers, trap types and locations, sample size to be tagged, number of nights to track each tagged bat).
123. In these situations, the following minimum standards will apply:
- All surveys aimed at Bechstein's bats must be designed and undertaken by a suitably experienced and licensed bat ecologist with experience of Bechstein's survey and mitigation. This person will be registered on the Natural England Level 3/4 class licence; and must produce and sign off the final bat report to be submitted with the planning application.
  - Trapping surveys must be undertaken with a Sussex Autobat acoustic lure, as this model has been shown to attract Bechstein's bats through use of synthesised Bechstein's social calls (Hill, 2005). Use of other types of acoustic lure must be justified, including provision of evidence that the call sequence is effective in attracting Bechstein's bats.
  - Surveys for Bechstein's bats are likely to be required throughout the active season (April to October), although winter hibernation surveys may be necessary in some circumstances. It should be noted that swarming sites for Bechstein's can be missed if surveys are not undertaken in August to October. It is particularly difficult to assess the importance of these sites or dismiss the presence of Bechstein's therefore a precautionary approach is important.
  - All Bechstein's bats caught will be ringed and the data shared, to support the ongoing strategic population studies.

## 7 BAT SENSITIVITY ZONES

### 7.1 What do bat sensitivity zones mean?

124. The maps provided as Figure 4 and Figure 5 show mapped Bat Sensitivity Zones for Trowbridge and the surrounding area, including land to the north of Westbury on account of the evidence gathered in respect of visitor movements from Westbury to Clanger and Picket Wood.
125. These sensitivity zones are accessible in high definition via the Wiltshire Council website to allow accurate identification of the boundaries of each zone with respect to individual sites.
126. The zones identify where development of new greenfield sites would cause a high or medium risk of negative impact on the bat populations associated with the Bath and Bradford on Avon Bats SAC (Bechstein's bat, lesser and greater horseshoe bats). The Bat Sensitivity Zones are divided into 3 levels, which accommodate two factors: the likely importance of the habitat for the bat SAC populations; and the potential for impacts due to increased recreational pressure on key woodland sites.
127. For each different Bat Sensitivity Zone, Table 2 below sets out the type of impact that could occur due to development and a description of the implications for development proposals within each zone. A summary of the main factors associated with each Sensitivity Zone is provided below. The evidence that has been used to derive the boundaries of each Bat Sensitivity Zone has been set out in Section 5.
128. Development within the Red Zone is located within 600m of woodlands or trees known to support maternity roosts for Bechstein's bat. New development of greenfield or residential brownfield sites within this zone is likely to result in high and unacceptable risks to bat populations, as a result of increased recreational pressure on key woodland sites and/or as a result of habitat loss. As such, development of new sites within this zone is highly unlikely to be permitted, and there should be no net increase in new residential curtilage or light levels within the zone.
129. The yellow medium risk zone represents the areas where habitat has been shown to be of importance, or is highly likely to be of importance, for Bechstein's, greater horseshoe and / or lesser horseshoe bat. Development of new greenfield sites is not precluded within these zones and sites have been identified within the draft Wiltshire Housing Site Allocations Plan. However, such development is likely to require significant and appropriate habitat mitigation measures to be provided on site significantly reducing the developable area, and therefore the density of development as described in Section 8 below. Other considerations such as light levels, noise etc. will also need careful design to demonstrate that they will have limited impact.
130. Within the yellow medium risk zone, it will be critical to ensure that adequate bat surveys have been undertaken to inform development in accordance with Section 6 of this Strategy. It will be expected that habitat features of importance for greater horseshoe, lesser horseshoe and Bechstein's bat, including roosts, foraging areas and commuting routes, are retained and enhanced *in-situ* ensuring full functionality: specific guidance on how this should be achieved is set out in section 8 below.
131. Development within the yellow medium risk zone will be expected to firstly, fully mitigate on site for the loss of habitat to ensure no net loss using an established metric based on best practice and secondly, make a financial contribution to mitigate against the in-combination effects of development on greenfield sites, through strategic habitat creation and enhancement (see section 9 and Appendix 1).

132. The dark hatched medium recreational risk zone represents the areas where new residential development is expected to result in increased recreational pressure on key woodland bat sites. **New residential development proposals within this zone will likely be expected to contribute towards the delivery of mitigation to address strategic recreational pressure (see Appendix 2). Such mitigation will be paid for through CIL.**

Table 2 Bat Habitat Sensitivity Zones

Level of Impact/ Risk	Type of Impact/ Risk	Implications for development
<p>RED ZONE HIGH RISK</p>	<p>Impacts will arise as a result of: Recreational pressure on woodlands used by breeding Bechstein's bats Loss of habitat of critical importance to supporting breeding Bechstein's bats Impacts will arise from developments considered alone and/or in-combination with other plans and projects</p>	<p>It is unlikely that development in this zone will be able to provide sufficient mitigation to enable an assessment under the Habitats Regulations to conclude, beyond reasonable scientific doubt, no adverse effect on the integrity of the SAC.</p>
<p>YELLOW ZONE MEDIUM RISK</p>	<p>Impacts will arise on individual sites and in-combination with other development as a result of: Loss and/or degradation of habitat of importance to Bechstein's, greater horseshoe and lesser horseshoe bats for foraging, commuting and roosting including:</p> <ul style="list-style-type: none"> <li>• Buildings</li> <li>• Grassland</li> <li>• Hedgerows</li> <li>• Trees</li> <li>• Scrub</li> <li>• Water bodies</li> <li>• Riparian corridors</li> <li>• Availability/access to roosts</li> </ul>	<p>Development on greenfield sites outside the settlement boundaries will be able to demonstrate no adverse effect on site integrity of the SAC provided that: 100% mitigation is provided for habitat loss within the allocation site boundary. Retained bat habitat remains connected to the wider habitat network and is adequately buffered in accordance with this strategy Bat habitat remains relatively undisturbed by the effects of urbanisation in accordance with this strategy A financial contribution is made towards funding the LPA scheme in Appendix 1 for mitigating residual in-combination effects from loss / degradation of bat habitat.</p>
<p>GREY HATCHED ZONE MEDIUM RISK</p>	<p>Impacts will arise in-combination with other development as a result of: Recreational pressure on woodlands used by Bechstein's bats</p>	<p>Residential development will be able to demonstrate no adverse effect on site integrity of the SAC provided that: Funding being collected via CIL towards the LPA scheme in Appendix 2 for mitigating residual in-combination effects from recreational pressure.</p>

Table 3 Criteria applied to derive bat **recreational** sensitivity zones

Level of Impact/Risk	Criteria
<p><b>RED ZONE</b></p> <p><b>HIGH RISK</b></p>	<p>This includes the area within 600m of identified woodlands containing core roosts.</p> <p>The Footprint Ecology Report (Footprint Ecology, November 2018) showed that the woodland bat sites draw visitors on foot for a radius of around 600m; beyond this, visit rates reduce to a low and constant rate. Any new residential development within the 600m radius is likely to increase foot visitors to the woodlands and therefore increase recreational pressure within the woodland. Recreational pressure is already being shown to have negative impacts to the woodland site, including the bat populations, so any additional incremental residential pressure would have an adverse impact on the integrity of the Bath and Bradford on Avon Bat SAC.</p> <p>Records within the GIS database shows that habitat within the red zones comprises critical habitat within the core foraging and feeding ground ranges associated with Bechstein's maternity roosts providing key resources now and in the future, in part compensating for limitations in the core woodland habitat.</p>
<p><b>YELLOW ZONE</b></p> <p><b>MEDIUM RISK</b></p>	<p>This zone is a composite of:</p> <ul style="list-style-type: none"> <li>• A 1.5km buffer around 'Core Roosts<sup>2</sup>.' for the Bechstein's breeding population in the Trowbridge area, including Green Lane Wood, Biss Wood and Picket and Clanger Wood. These buffers are referred to as 'Core Areas' in the Wiltshire Bat SAC Guidance page 7, section 3.2 (Wiltshire Council, September, 2015) 'Core Areas' are of particular importance for foraging and commuting bats associated with the 'Core Roosts'.</li> <li>• A 4km buffer around 'Core Roosts' for greater horseshoe bats and a 2km buffer around 'Core Roosts' for lesser horseshoe bats where these overlap with the Trowbridge Community Area.</li> <li>• Key commuting corridors which link the above-mentioned Core Areas with the SAC which lies beyond the Trowbridge Community Area. These include: the River Biss and railway line through Trowbridge; the area known as the Hilperton Gap in north Trowbridge; land to the south west of Trowbridge and; land to the north east of Trowbridge. Evidence comes from radio tracking and verified records of Annex 2 species found in this locality.</li> </ul> <p>This zone is relevant to development at new greenfield sites and as such excludes existing urban areas as defined by settlement boundaries.</p> <p>Note that the Wiltshire Bat SAC Guidance is subject to review and this zone will need to be reconsidered if 'Core Areas' are amended in the light of new scientific information.</p>
<p><b>GREY HATCHED ZONE</b></p> <p><b>MEDIUM RISK</b></p>	<p>The Footprint Ecology Report has identified the zone of influence within which new residential development is likely to result in increased recreational use of the woodland bat sites. As a minimum, the Footprint Ecology Report states that (para 6.46) the outer limit of the zone of influence should comprise the settlements of Trowbridge and Westbury. For areas outside the settlement boundary, the zone from which 75% of visitors originate has been mapped in accordance with recommendations in the Footprint Ecology Report (which comprises 3.356km for Clanger and Picket Wood and 2.656km for Green Lane Wood).</p>

## 7.2 How bat sensitivity zones have been derived

133. The baseline sources from which the Bat Sensitivity Zones have been derived are listed in Section 3.2.7 of this document. The various bat data have been compiled on a GIS database. Table 3 sets out the

<sup>2</sup> The Wiltshire Council Bat SAC Guidance includes the following criteria for 'Core Roosts' relevant to this document: breeding or wintering roosts containing 50+ adult greater horseshoe bats; breeding roosts containing 100+ or wintering roosts containing 50+ adult lesser horseshoe bats; any traditional breeding roosts for Bechstein's bats.

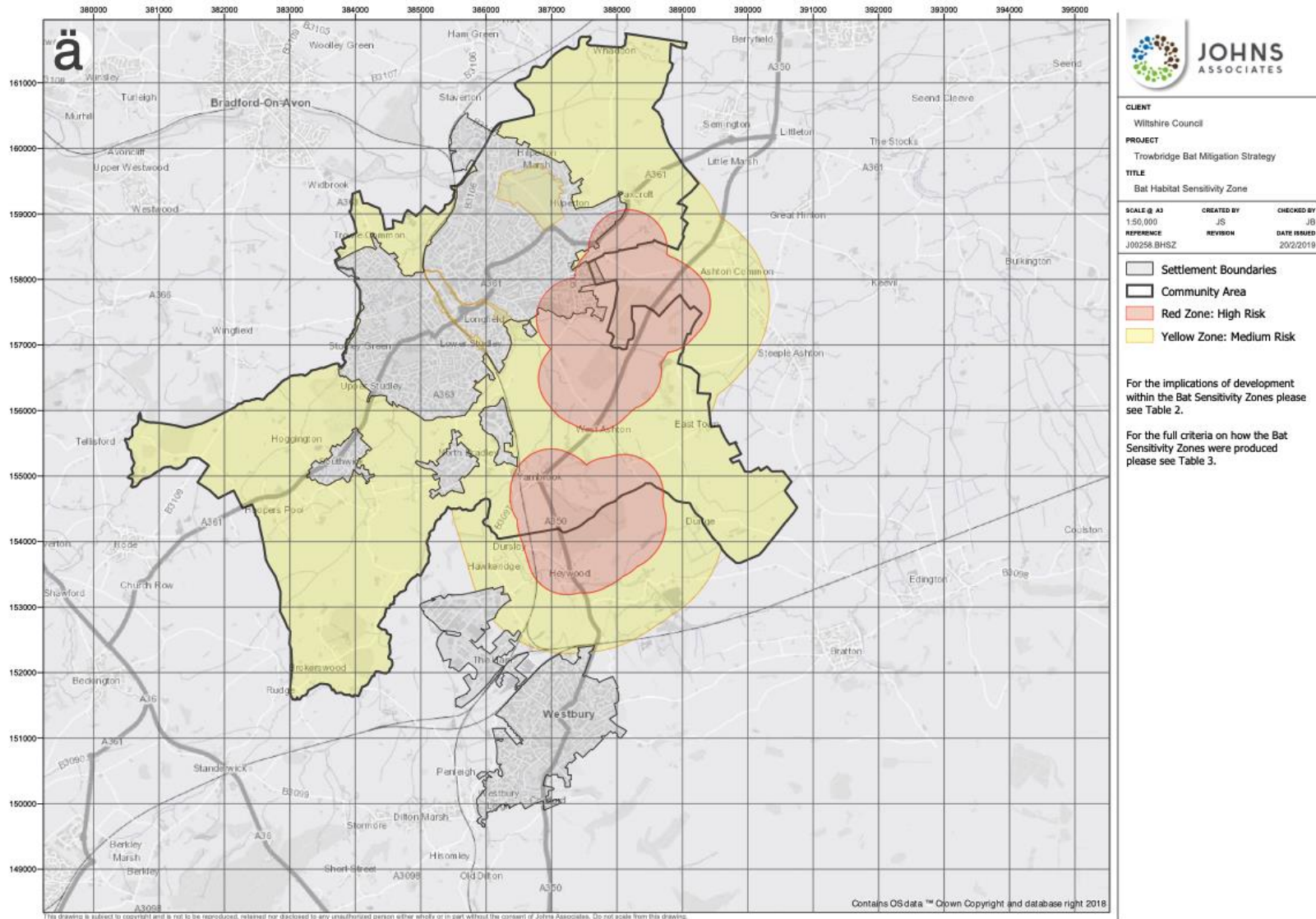


criteria that have then been applied to determine the boundaries of each zone in accordance with the GIS database.

### 7.3 Review of bat sensitivity zones

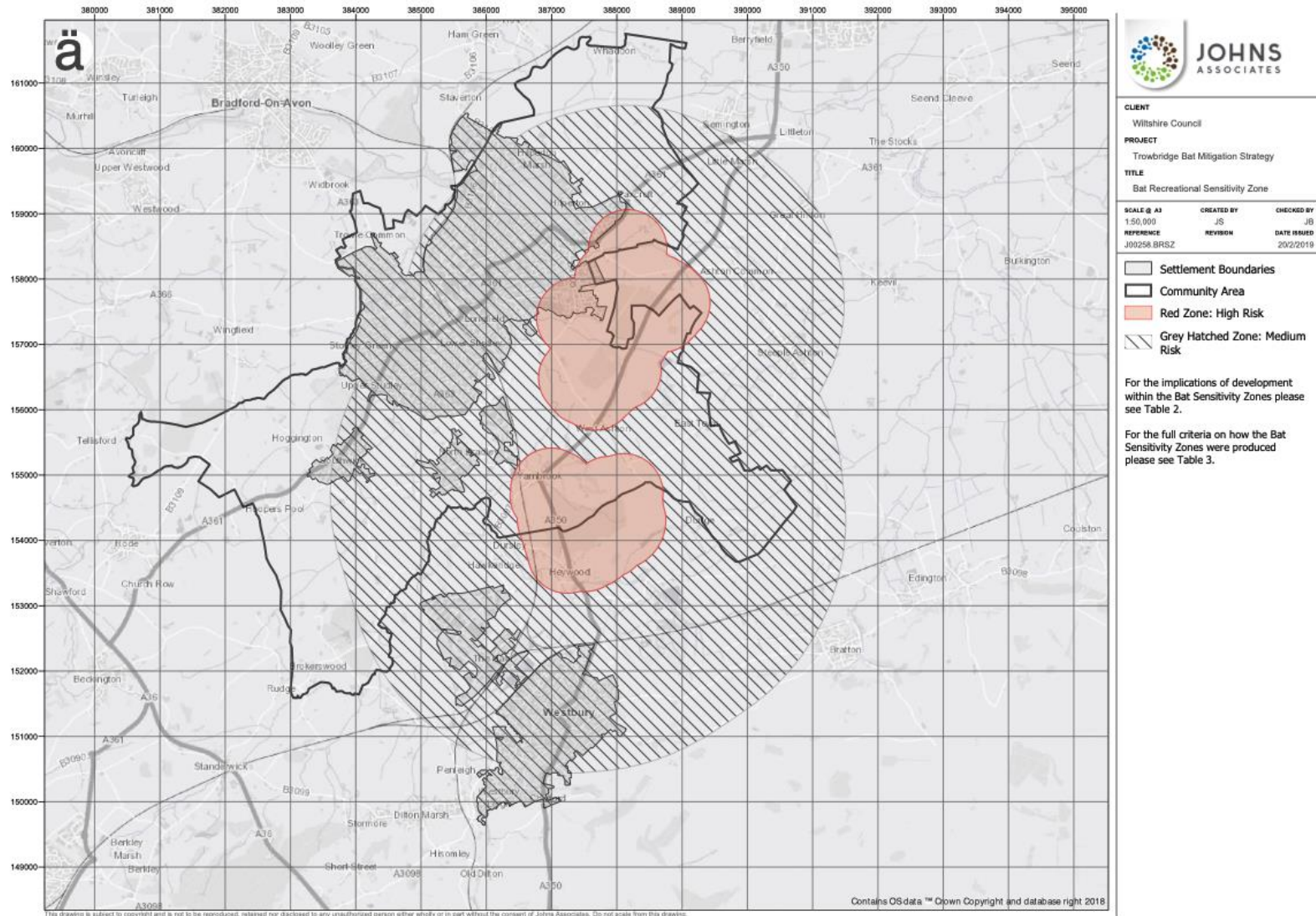
134. The Bat Sensitivity maps that have been created during this process must be considered dynamic documents as the relative importance of landscape features will alter as the area is subject to further development and habitat change. The intention is that this document and the corresponding mapping outputs will be periodically reviewed to ensure that it remains relevant to the present landscape.
135. The importance of landscape features and habitats for bats, particularly relating to those species associated with the Bath and Bradford on Avon SAC, has been assessed for the purposes of this document based on the current scientific research and understanding of the ecology of these species. As further research is published that alters our understanding, this assessment should be revised to accommodate any new information. For example, the 'Core Areas' sourced from the Wiltshire Council Bat SAC guidance (Wiltshire Council, September, 2015) are based on generic research for the SAC species. The actual location of key foraging elements may in some cases be beyond the currently mapped 'Core Area' range; and asymmetry in habitat dispersal may strongly influence bat activity. It is therefore essential to maintain a feedback loop in the process to allow additional areas to be added to the 'Core Areas' where necessary.
136. It should be noted that the Wiltshire Council Bat SAC Guidance is regularly reviewed and updated to take account of latest scientific information. Any changes to this overarching guidance may therefore result in further changes to the Bat Sensitivity Zones for Trowbridge and the surrounding areas. For example, evidence is emerging that the local population of Bechstein's bat requires a larger summer range than other studied populations and Core Areas may therefore need to be extended around other woodlands that have been shown to support breeding sub-colonies (e.g. Woodside Wood).

Figure 4 Trowbridge Bat Mitigation Strategy – Bat Habitat Sensitivity Zones



N.B. This document has been created to address development in the Trowbridge area and in particular the Housing Sites Allocations Plan, the extents to which this strategy applies are therefore restricted to a combination of the Community Area and suitable buffer areas surrounding the strategic woodlands. Any development proposals outside of these zones, and therefore the scope of this document, will still be subject to detailed assessment in relation to the potential impacts on bats and will require separate mitigation measures independent of those described within this document. These mitigation requirements are beyond the scope of this document.

Figure 5 Trowbridge bat Mitigation Strategy – Bat Recreational Sensitivity Zones



N.B. This document has been created to address development in the Trowbridge area and in particular the Housing Sites Allocations Plan, the extents to which this strategy applies are therefore restricted to a combination of the Community Area and suitable buffer areas surrounding the strategic woodlands. Any development proposals outside of these zones, and therefore the scope of this document, will still be subject to detailed assessment in relation to the potential impacts on bats and will require separate mitigation measures independent of those described within this document. These mitigation requirements are beyond the scope of this document.

## 8 ON SITE MITIGATION REQUIREMENTS

137. **This section sets out generic standards for all developments located within the Yellow Bat Sensitivity Zones** (and also the Red Zones on the occasion that it is deemed acceptable in principle, for example for minor householder applications). This section has been based on the guidance contained within the Wiltshire Council Bat SAC Guidance (Wiltshire Council, September, 2015), but includes additional specific requirements for the Trowbridge area.

### 8.1 Recommended Approach and Information Required for Planning Applications

138. The requirements for ecological mitigation must be used to guide development design from the outset. The necessary mitigation measures for bats will work when integrated as a fundamental component of the scheme design; but conversely, are unlikely to be successful when tacked on to a scheme retrospectively. Developers are encouraged to seek pre-application advice through a formal pre-application request in order to understand how the Council Ecologists are approaching this matter and to reduce the risk of applications being unsuccessful.
139. Mitigation proposals must be developed in close consultation with other professionals such as highways / lighting engineers, landscape architects and urban designers to ensure that they are realistic, achievable and deliverable, and can be maintained in the long-term without creating conflicts with the needs or aspirations of highways uses and local residents.
140. Ecological mitigation design must be based on good standards of bat survey (in accordance with Section 0) and must address all habitat features of value for Bechstein's, greater horseshoe and lesser horseshoe bat (including roosts, foraging areas and commuting routes). The design must focus on retaining, protecting and buffering these habitat features so their key functionality can be retained in accordance with guidance set out in Section 8 of this document.
141. Development of site allocations and large neighbourhood plan sites are expected to be subject to a prior rigorous whole site masterplanning process, either via a Development Brief, or via an outline planning application that covers the entire allocation. The masterplanning process must incorporate key bat habitat features as a fundamental component of the site design. A Parameters Plan (PP) must be prepared identifying areas of the site where specific sensitive design measures or restrictions will be required and areas which are to remain undeveloped or form part of the landscaping. The Site Masterplan will demonstrate how the development proposals could be delivered in light of those constraints. Outline planning permission, if granted, will be subject to compliance with the PP.
142. For full and reserved matters planning applications, an Ecological Mitigation Plan (EMP) must be submitted as a formal planning application drawing. This may incorporate other landscape details as appropriate. The EMP must be a scaled plan that clearly shows the following information:
- Location and dimensions of replacement roosts plus separate architectural drawings to show detailed design and materials for bat houses. Plans must demonstrate how replacement roosts are tied into the surrounding landscape in terms of providing suitable vegetation to shelter emerging bats and in terms of connectivity to commuting routes and foraging areas.
  - The EMP should be based on topographical survey and must show the accurate location, extent and area of connective / foraging habitat to be retained, created or enhanced.

- Any proposed tree or shrub planting and areas of wildflower grassland to be seeded must be scaled and accurate with the extent and areas shown and with full landscape specifications. Further details are provided in Sections 8.2 and 8.3.
- The EMP must identify required temporary working areas as well as the boundary of the permanent built development. Accurate development boundaries should be overlaid on the EMP to allow accurate scaling and location of mitigation measures.
- Detailed and scaled cross-sections linked to the EMP should be provided. These should show all structures and vegetation to be provided together with minimum widths and distances for each component (see also Section 8.2 below).
- The timing of the delivery of measures included within the EMP is crucial to the assessment of the suitability of these measures, risks of delivery and the impact of any lag between habitat removal and the establishment of replacement habitats/features. As such, a detailed schedule of works should be submitted describing the delivery timescales for all measures included within the EMP.

143. For development proposals affecting Bechstein's, greater horseshoe and lesser horseshoe bat habitat, the following additional information is likely to be required to support planning applications:

- Pre and post development lux contours (see Section 6.2) plus details of lighting design (see Section 8.3);
- A Construction Method Statement which sets out how impacts to bat habitat features will be managed during the construction phase. Consideration must be given to timescales for the new planting to become effective. New connective habitat should be in place at the earliest possible stage and conditions may be used to secure planting pre-commencement or before completion; and
- A Landscape and Ecology Management Plan (LEMP) that includes a Habitat Management Plan (HMP) to ensure the successful long-term habitat management of bat habitat. This must identify who will be responsible for undertaking the management as well as mechanisms of funding together with aims and objectives of management. Initial management prescriptions and timescales should be specified together with a review mechanism for updating the HMP as required;

144. Commuting routes and foraging areas should be retained within the public realm where they can be effectively protected and appropriately managed for bats in accordance with the approved LEMP in perpetuity under the terms of an enforceable planning condition or legal agreement.

145. Implementation of the overarching mitigation strategy and submitted supporting information, including the PP and/or the EMP and/or the LEMP, will be secured either through a condition or legal agreement of any permission granted. If insufficient mitigation measures are provided to demonstrate that the bat populations would be adequately protected, the local authority will have no legal alternative but to refuse the application.

146. Further details of the information that will be expected on lighting, habitat creation and enhancement associated with connective and/ or foraging habitat and associated buffer zones have been provided in Section 6.1 below.

## 8.2 Standards for Habitat Mitigation Within the Site

147. This section sets out the standards for mitigation and creation of habitat for Bechstein's, greater horseshoe and lesser horseshoe bat, together with the minimum information that must be submitted to demonstrate that proposals will be effective.

## 8.2.1 General principles

148. It is expected that all direct and indirect impacts on bat habitat will be entirely mitigated within the respective allocated site of the HASP and any other site. It is expected that important features will be retained and reinforced and enhanced as dark zones to retain connectivity for bats in the landscape. **The most important general principle is that wide swathes of land are required to be set aside as core bat habitat in order to retain a permeable and functioning landscape for the target species.** Development areas for each allocated site have been estimated as set out in Table 4 below. For each allocated site, it is anticipated that in most circumstances the full residual green space will be required for mitigation.
149. The diagram in Figure 6 below provides an illustration of retention and enhancement of core bat habitat (Zone A) in relation to the development area.

Table 4 Trowbridge housing sites estimated area of land to be developed and land available for mitigation

Trowbridge	Community Reference/Site Name	Original Number of dwellings and size	Revised Number of dwellings and size	Estimated Development Area (based on 30 dph ie total no. of dwellings /30)	Estimated residual green space/on-site mitigation
H2.1	Elm Grove Farm, Trowbridge	200 Approx. 14.33ha of land	250 Dwellings Approx. 17.78ha of land	8.33ha	9.45ha
H2.2	Land off the A363 at White Horse Business	150 Was 25.62ha	175 Dwellings Approx. 18.96ha land	5.83ha	13.13ha
H2.3	Elizabeth Way, Trowbridge	205 Was 16.33 ha	355 Dwellings Approximately 21.24 ha of land	11.83ha	9.41ha
H2.4	Church Lane, Trowbridge	45 Was approx. 3.72ha	45 Dwellings 5.93 ha of land	1.5ha	4.43ha
H2.5	Upper Studley, Trowbridge	20 Was 2.33ha of land	45 Dwellings 2.27ha of land	1.5ha	0.77ha
H2.6	Southwick Court, Trowbridge	180	18.17ha 180 dwellings	6ha	12.17ha
Total			1,050 Dwellings Approx. 84.35ha	34.99ha <sup>1</sup>	49.36ha

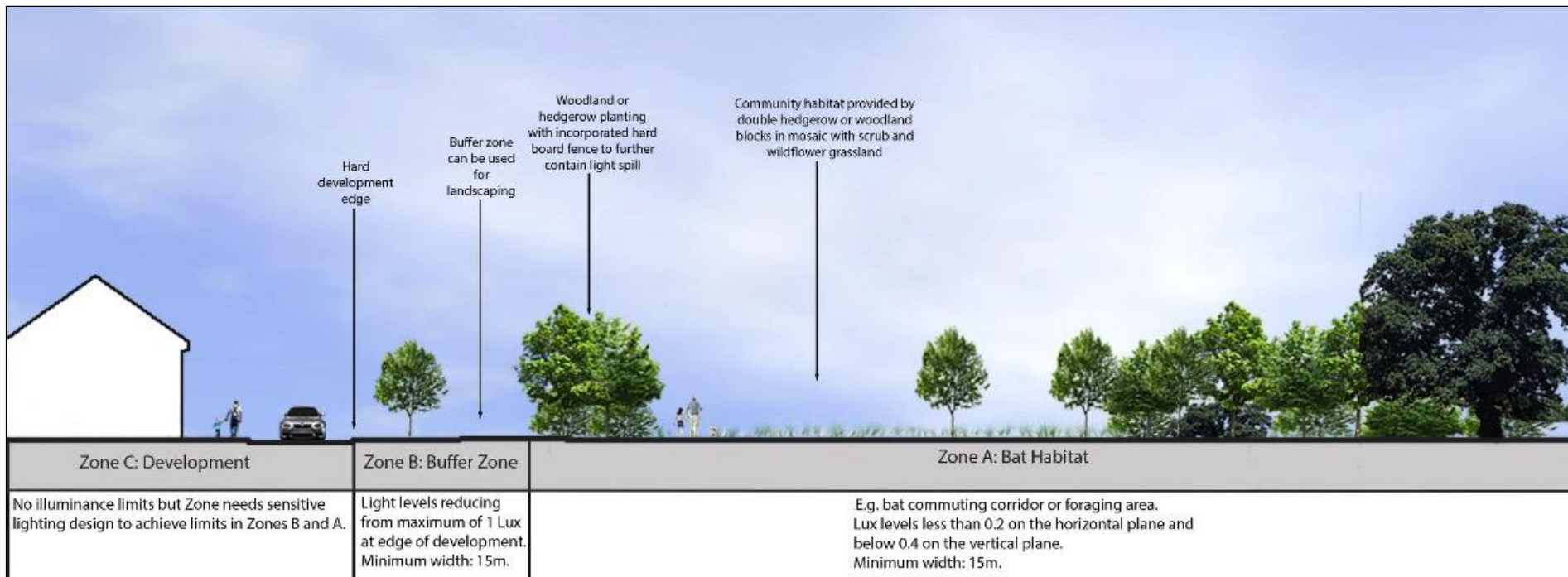
<sup>1</sup> Development Area is considered to be all the land in Zones B and C as shown on the illustrative section given in Figure 6.

NOTE: The allocations in the WHSAP include allowances for on-site mitigation to address identified constraints including: flood risk, ecology, landscape, historic environment. Based on a conservative estimate that the sites will be built out at 30 dwellings per hectare, the estimated site development area can be expressed as above.

150. In addition, to retention and enhancement of core bat habitat, **adequate buffer zones must be provided for retained, enhanced or newly created bat habitat** (see Figure 6 below). It is likely to be necessary to buffer bat habitat features considerably from development in order to secure suitable habitat conditions and suitable light levels, taking into account the potential for private owners to fit their own external/security lighting in the future. A minimum standoff distance of 15m from the development to the outside edge of any part of the bat core habitat is required to be provided as a buffer zone. The minimum buffer zone (Zone B) that must be provided from bat habitat features is shown in Figure 6 below, together with associated lux level requirements. Further descriptions of acceptable land uses within the buffer zone is also provided in Section 8.2.
151. The following general principles also apply for habitat creation and retention (see also Sections 8.2 and 8.3 below):
- **Substrate:** using the correct planting substrate is critical to the eventual success of new habitat creation. For example, wildflower-rich grassland should be created on soils with low nutrient content, whereas good sub and topsoil depth and structure is required for tree and shrub planting. It is expected that full details of planting substrate must be provided with planning applications, including the results of soil testing in some instances.
  - **Species** to be planted or sown must be native and locally appropriate to the Trowbridge area.
  - **Programme:** a timeframe for habitat creation and enhancement together with timing of expected management measures must be provided. It is expected that all habitat creation and enhancement measures will be implemented at the optimum time of year unless otherwise justified e.g. tree planting during the winter; and sowing seed in the spring or autumn.
  - **Detailed methodology** must be specified that sets out how habitats will be created or enhanced.
  - **Management methods** must be specified for immediate aftercare of created/ enhanced habitats. For example, maintenance of tree planting, with replacement of all failures after three years.
  - **Methods** for long-term management of created/ enhanced habitats must be specified.



Figure 6 Core bat habitat feature and associated buffer zone



## 8.2.2 Hedgerows

152. Hedgerows act as commuting structures, foraging habitat and provide feeding perches for horseshoe bats and probably for Bechstein's bat. Priority should be given to enhancing existing hedges, particularly ancient hedges, through planting up gaps and implementing improved management regimes for the long-term. Methods for restoration of hedgerows such as coppicing or laying must be specified in detail. Hedgerows which are breached in order to provide access routes are not readily mitigated by adjacent planting to create hop-overs and therefore such impacts must be mitigated through alternative mitigation to achieve the same level of functionality.
153. New hedge lines may provide effective mitigation if they divide large fields into smaller units and/or provide links to other bat habitat such as blocks of woodland. Hedgerows must be considered as being located entirely in Zone A and the strict illuminance limits specified in Section 8.3 must apply. Hedgerows used for bat mitigation must be capable of being managed to meet the following criteria:
- be at least 3 to 6 metres wide
  - at least 3 metres high
  - contain standard trees planted frequently along their length.
  - Cutting /trimming every 2-3 years
  - Sufficient space adjacent to the hedgerow to allow for 2-3 years growth and access for maintenance. This area to be managed as species-rich grassland.

## 8.2.3 Woodlands

154. Woodlands provide core foraging habitat for all three target species of bat. It is expected that all existing areas of woodland will be retained as part of development proposals. Mitigation may take the form of enhancement of woodland habitat in line with the principles outlined in this section.
155. Even recently-planted copses have been shown to provide value in the Trowbridge landscape for foraging Bechstein's bat and therefore inclusion of new woodland planting as part of development proposals should be considered as mitigation, either to extend existing woodland habitat or as new copses.
156. In general, woodland blocks should be as large as possible; and should be directly connected to suitable bat habitats in the surrounding landscape. They should support a diverse and species-rich mix of native tree and shrub species in the canopy and understory layers.
157. Trees and shrubs for new woodland should be planted in naturalistic non-linear patterns. Specifications for new woodlands must include adequate detail, including a planting schedule that specifies species, stock, ground preparation, planting density, timing, planting methodology, weed control, plant protection and long-term maintenance. Aftercare management, until such point that the woodland is established, will be particularly important.
158. When designing woodlands, the target species needs to be considered. For example, Bechstein's bat prefers woodland with a closed canopy and a dense understorey. Lesser horseshoe bats prefer to forage in the woodland interior where micromoth abundance is greatest: and therefore, require proportionally less woodland edge exposed to the surrounding matrix, but with constant canopy cover and a diverse understorey. Whereas greater horseshoe bats show a preference for large grassy rides and glades where macromoth abundance will be greatest.

159. Woodland edge should be managed with diverse structure. Scalloped edges and bays will provide sheltered areas with higher insect concentrations. Management should aim for a structured transitional edge with a variety of types of vegetation from trees to shrubs and rough grass.
160. Whilst formal access and anthropogenic disturbance (e.g. lighting, noise) is unacceptable within on-site mitigation woodlands, a degree of well managed informal access may be permitted, subject to an assessment as to the degree to which this recreational use would compromise the provision of high quality foraging habitat for bats.

#### 8.2.4 Aquatic habitat

161. Aquatic habitat is used for foraging to a greater or lesser extent by all target species of bat. Bechstein's bat has been shown to prefer woodland in close proximity to water; whilst caddis flies (with an aquatic larval stage) are an important secondary food source for greater horseshoe. Prey favoured by lesser horseshoe includes mosquito, gnat and caddis fly, all of which have an aquatic life stage; and note that gnats and midges also use damp places near water to breed.
162. Therefore, incorporation of new ponds and waterbodies into habitat creation schemes should be considered, providing that these features are linked to other favoured habitat types, particularly woodland and hedgerows. Ponds or water bodies with permanent water should be created in dark areas. It is possible that these could form SuDS attenuation features as part of the surface water drainage design for a development.
163. The aim should be to achieve a varied and diverse habitat on the banks of ponds, including varied bank profiles with small bays and headlands, and a diverse structure to marginal vegetation (trees, shrubs and tall herbs and grasses). Ponds should be created with varying depths and undulating topography to the bed.
164. Where bank management is necessary, restrict it to a small area and work on one bank at a time. Carry out management sensitively, aiming to enhance variation and structure in vegetation.

#### 8.2.5 Grasslands

165. Although good for bats, grazed pasture is unlikely to be a practical option for most development schemes. The creation of species rich grassland is likely to be more feasible for mitigation, particularly where impacts to horseshoe bats are predicted. This will need to be managed to produce a long sward to support an abundance of Noctuid moths, one of the main prey items hunted by greater horseshoe bats, as well as micromoths hunted by lesser horseshoe. Specified seed mixes should include food plants, as well as grasses, such as dandelion, dock, hawkweeds, plantains, ragwort, chickweed, fat hen, mouse-ear and red valerian and other herbaceous plants. Wildflower grassland creation must be specified in detail (including seed mix, ground preparation, sowing methodology and aftercare).
166. Management of grassland areas should aim to encourage development of a grassland-scrub mosaic to provide structured and sheltered habitat and to encourage a diverse range of prey species. Management should comprise rotational cutting with cuttings removed. Cutting should be undertaken in late autumn.

### 8.3 Lighting

167. Some of the technical information in this section has been reproduced with the kind permission of Bath and North East Somerset Council from their Waterways Design Guidance Protecting Bats in Waterside Development (Bath and North East Somerset Council, 2018).

168. In addition to the guidance set out in this section, it is expected that the approach to lighting for new development is undertaken in accordance with the guidance in (Bat Conservation Trust and Institution of Lighting Professionals, 2018).
169. It is essential that the bats and lighting issue is acknowledged and integrated into the design process from the outset, and in an iterative way. It should not be left to later design stages or be retrofitted into development proposals.
170. As an overarching principle, dark corridors must be maintained around roosts, foraging areas and commuting corridors with no net increase in light levels as a result of the development in areas used by bats. It should be noted that enhancements over the existing baseline must also be built into scheme design wherever possible i.e. development schemes that actively reduce any existing elevated lux levels associated with bat habitat features.
171. Each development scheme is likely to require bespoke lighting mitigation, designed by a lighting engineer, working in collaboration with a specialist bat ecologist.

### 8.3.1 Illuminance Zones

172. Development sites should include a discrete buffer zone oriented parallel to each retained bat habitat feature. The zones shown on Figure 6 and described below must be used to determine the boundaries for the control of light spill to be imposed at the outset of scheme design.
173. It is critical that the bat habitat zone (Zone A) is maintained in 'completely dark' conditions, defined as < 0.2 lux on the horizontal plane and less than 0.4 lux on the vertical plane (measured at 1.5m and 4m) (Bat Conservation Trust and Institution of Lighting Professionals, 2018). There must be no glare impact from the development within this zone.
174. The buffer zone (Zone B) is the area where the urban environment gives way to softer landscaping and natural features. It is expected that habitat sympathetic to the bat habitat zone will be created in the buffer zone. However, the buffer zone can also be multi-functional in that it can be used as public open space, access for pedestrians and cyclists, soft landscaping with native species, or fencing. It is critical that the buffer zone is unlit, with strict illuminance targets to be met (within the range of <1 lux on the horizontal plane measured at the development edge of the buffer zone reducing to <0.2 lux on the horizontal plane at the boundary with the bat habitat zone).
175. The development zone (Zone C) is characterised by a dominance of hardstanding and built structures. While lighting is required in this zone, sensitive lighting design will be required in order to achieve illuminance targets within the buffer zone and the bat habitat zone and to avoid upward spread of light and thereby minimise environmental impacts more generally.

### 8.3.2 Prediction of post-development lighting conditions

176. A detailed Lighting Impact Assessment (LIA), including modelled lux contour plots or similar plans displaying projected illuminance levels, is required and should be prepared by a suitably competent lighting professional. The LIA should show the number, location and specification of each luminaire within the development, including its orientation, dimming, shielding, height, recessing, tilt and its output. All luminaires apart from those solely used in emergency situations must be included within the modelling and be set to their intended normal output levels during active use. Motion-sensitive or security lighting e.g. for individual dwellings is not considered emergency lighting and should be included.

- 177. All areas of the development site must be modelled using a horizontal ground level calculation plane, with modelled contours shown on a horizontal illuminance contour plan. Additionally, separate calculation grids should be included where potential bat habitat features would be affected by increased light levels to show vertical plane illuminance at 1.5m and at 4m (with vertical illuminance contour plans provided). These directions and heights correspond to likely horseshoe and Bechstein's bat behaviour and enable light spill from all directions to be accounted for.
- 178. The potential for glare, source intensity in candelas, should be considered and a discussion of its potential to be felt (by humans) at locations beyond the site boundary should be given.
- 179. Software used should be an industry-recognised package operated by a lighting professional.
- 180. Illuminance calculations will need to combine the outputs of exterior and interior light sources, thereby including the component of light transmitted via windows and other openings. Interior lighting to be modelled in all areas where there is potential for light to emanate through glazing, towards any sensitive bat habitat features. It is essential that the worst-case scenario is modelled i.e. all interior lighting switched on, and assuming no curtains or blinds in operation. Any light transmission factor applied to the glazing (tinting) should be clearly stated.
- 181. A maintenance factor of 1 should be applied to all lighting calculations and all lumen outputs must be based on a luminaire's Initial Lumens (IL) in order to show its 100% intended 'Day 1' output.
- 182. While soft landscaping planting is highly encouraged and can make a significant impact on attenuating glare and illumination, it cannot be factored in to the illumination models for several reasons. Newly planted vegetation may take several years to become established and may be removed in later years causing problems in enforcing planning conditions. The screening effects of immediate and more permanent barriers such as fences, walls and banks should be factored in by using topographical data within modelling.

### 8.3.3 Lighting design solutions

- 183. The following measures should be considered for incorporation within lighting schemes to reduce and minimise the impact from development. Lighting design must be undertaken by a suitably competent lighting professional.

#### 8.3.3.1 *Mitigating light spill from exterior lighting provision*

- 184. Consider whether exterior lighting is absolutely required and avoid lighting where unnecessary. The likely uses of the external spaces/routes of a development must be fully understood to determine whether they should be lit after dark, and if so how, to what level and during which hours of use after dark. All of these should be articulated as part of a proposal.
- 185. Consider using barriers to light: light intensity can be reduced in some locations by creating a light barrier to restrict the amount of light spill reaching sensitive areas. Barriers can be in the form of walls, bunds or fences. Vegetation can be used to enhance these features, but shouldn't be relied upon in achieving desired light levels.
- 186. Where lighting is unavoidable, seek to reduce light intensity and numbers of luminaires, and ensure the use of the most directional and focused luminaires available. Careful specification of optics and light shielding/shaping accessories fitted to luminaires as specified by a lighting professional can further reduce light spill. Aim to ensure that the Upward Light Ratio (ULR) of the installation is limited to

0% in order to stop poorly aimed luminaires and reduce glare. Mounting heights should be minimised to reduce the distance light can spill.

187. Light sources with low blue and low UV content to be employed. In preference modern LEDs should be selected as these emit significantly less or no UV light so are less disruptive to both insects and bats. Warm colour temperature LED light sources to be employed preferably at 3000Kelvin (as these have been shown to cause less impact on bats) (Stone E. L., 2015; Stone E. L., 2009; Stone E. L.).
188. Installation by developers of specified security lighting will minimise the likelihood of new occupants installing their own devices. Such essential specified security lighting should exclusively use PIR motion-sensitive luminaires located and designed to avoid light spill into bat habitat and buffer zones. Security lighting must be specified to minimise above horizontal outputs and should comprise LED warm light sources (at 3000Kelvin).
189. Consider the use of Control Management Systems (CMS) to apply dimming regimes during the night to reduce levels of illuminance during periods of high bat activity (typically soon after dusk and the hours pre-dawn) or to ensure lighting only comes on when it is needed –e.g. when activated by the movement of pedestrians. Pre-programmed dimming must be included on all highway lighting with the dim level appropriate to the location and highway safety requirement. Even colour shifting can be considered. This should not be at the expense of public safety and could include the use of presence detectors to enable light levels to intensify or light colours to shift when required. E.g. Low levels of amber-red light could be employed along protected corridors, with warm white light with increased colour rendering activated to support pedestrian safety and security.

#### 8.3.3.2 *Mitigating light spill from interior lighting provision*

190. Building set back and orientation can dramatically reduce the reach of light spill and the encroachment on sensitive bat habitat features so should be carefully considered with the input of a lighting professional.
191. The careful planning of internal building layout and proposed use may be an option for achieving the above standards near bat habitats where: there are space restrictions on small developments; existing buildings are being retrofitted; or in very limited circumstances for larger developments. The following factors should be taken into consideration. However, as many of these factors are difficult to enforce for the lifetime of the development, their suitability will be assessed against the particular significance of the bat feature concerned.
  - The design and depth of window reveals and reduced transparency of glazing to substantially reduce light transmission.
  - The use of balconies and louvered windows to reduce light transmission onto sensitive bat habitat features.
  - Tight optical control must be applied to any luminaire within 1.5m of glazing. This includes the use of, for example, 'darklight' type downlights with deep recessed light sources and focused beams. Diffuse fluorescent type luminaires should be avoided alongside glazing.
  - Light fittings can be set back away from windows and also recessed into ceilings rather than using pendant luminaires to further control light transmission.
  - Light spill from ground floor spaces should not extend beyond 1.5m of the glazing line.
  - In the case of office lighting, lighting to areas behind glazing should be controlled on a separate lighting circuit to enable them to be switched off or dimmed separately when a different area of the office floor is in use.

- All internal lighting must be switched off when the room is unoccupied – this is only relevant to commercial buildings and should be achieved through the use of lighting control systems and/or appropriate building management.
- The use of automated dimming circuits and automated blinds on windows to attenuate light spill is unacceptable due to concerns regarding their long-term maintenance.

#### 8.3.4 Monitoring of lighting

192. In order to ensure the accuracy of modelled lighting and conformity with predicted lux contours, a post-development lighting survey should be carried out by a lighting professional using a calibrated cosine corrected light meter within three months following completion. This will be required by planning condition provided that options for remediation are likely to be available. Otherwise the planning authority will place the onus on the developer demonstrating that a precautionary approach has been followed. A further compliance survey may also be required 2 years post-completion to check that no alterations have been made within the development.
193. The survey should be carried out with all lighting active (to replicate the lighting state within the modelling) and notes should be taken as to the output and activity of luminaires observed during the survey. Surveys should be timed to take place on evenings of little moonlight, either due to cloud cover or a new moon. Readings of illuminance should be taken at representative locations according to the planes and orientations used in the modelled calculations as chosen by the lighting professional. Results and discussion must be submitted to Wiltshire Council for approval.
194. Where lighting levels are greater than predicted, remedial measures must be put in place to reduce illuminance as per the lighting condition.

## 9 OFF-SITE AND STRATEGIC MITIGATION

### 9.1 Habitat Mitigation Measures – The Batscape

195. One of the main aims of the strategic mitigation set out within this document is to ensure the capacity and permeability of the landscape to support foraging and commuting Bechstein's, greater horseshoe and lesser horseshoe is maintained (through a network of habitat enhancement, restoration and creation). This will support the viability of the bat populations; and ensure that they are sufficiently robust to respond dynamically to landscape change.
196. The strategic mitigation measures set out in this section are designed to address the potential 'in-combination' and residual impacts from development allocations within the HSAP, primarily arising due to the incremental loss of areas of 'poor quality' habitat such as species-poor improved grassland or grazed pasture, but also the potential cumulative loss of connectivity arising through increasing levels of urbanisation. When assessing the impact of a single development, it may be reasonable to assume that loss of small quantities of poor-quality habitat will not result in an impact on the SAC when considered alone. However, such impacts considered at the landscape scale i.e. 'in-combination' with other developments may add up to a more significant impact due to cumulative loss of foraging habitat and connectivity for bats. These in-combination impacts are intangible and difficult to measure, and therefore the approach set out in this section adopts a precautionary approach to ensure adequate strategic mitigation is provided at the landscape-scale.
197. As a starting point, a detailed GIS database will be compiled that identifies specific opportunities within the landscape around Trowbridge for habitat enhancement, restoration and creation, based on known bat use of the landscape; expert opinion from local batworkers; and analysis of aerial photography to identify areas of poor or degraded habitat. It will be important that new habitat creation is planned carefully to avoid negative changes to existing bat habitat. For example, creation of new woodland on a grazed pasture site will need to consider any potential impact to foraging greater horseshoe bat.
198. Specific habitats that will be targeted for enhancement, restoration and creation will include those listed below. The overall principles and objectives for each habitat are set out in Section 8.2 above:
- Woodland – expansion or new blocks. A target minimum of 6 ha will be provided over the period of the HSAP to reflect actual numbers of new dwellings in greenfield sites that come forward;
  - Hedgerows – gapping up, improved management (tall and bushy with more trees) or new hedgerows with trees. A target minimum 11km of new hedgerow will be planted over the period of the HSAP to reflect actual numbers of new dwellings in greenfield sites that come forward;
199. All habitat enhancement, restoration and creation must be delivered EITHER within one of the yellow bat sensitivity zones OR within 1.5km of a yellow zone illustrated on the plan in Figure 4.
200. Measures implemented in close proximity to the known important bat roosts will be prioritised over those located at greater distance.
- 9.1.1 Delivery mechanism and implementation
201. The anticipated delivery mechanism to achieve habitat enhancement, restoration and creation is likely to comprise a number of different options. In the first instance, a Project Officer will be



appointed by Wiltshire Council to manage the delivery on the ground, which will be funded by developer contributions (see Appendix 1).

202. It is envisaged that other habitats (hedgerow and woodland management and creation) will be delivered through a new Bat Stewardship Scheme that will be set up and administered by the Project Officer. Grants will be allocated to individual land owners, dependent on the type and quantum of habitat to be delivered. Funding will be dependent on long-term delivery of habitat management.
203. Additional habitat, particularly new woodland, will be delivered through a variety of means, including contributions towards off-site planting and land acquisition. It is intended that Wiltshire Council would purchase the land with the Project Officer being responsible for woodland establishment. Land would then either be retained by Wiltshire Council or would be passed on to an appropriate organisation for long-term management.
204. In the first instance, the Project Officer will develop a package of work to produce a handbook and agreed Terms of Reference for the Bat Stewardship Scheme. This will set out full details, including the following:
- The area covered by the scheme;
  - How the Bat Stewardship will work in parallel to add to and complement national stewardship schemes;
  - Who will be eligible to apply;
  - What land (and habitats) will be eligible;
  - Criteria to be used for judging submitted applications;
  - How long the agreements will operate;
  - Options for capital works (e.g. new hedgerow planting);
  - Options for management works (e.g. management of hedgerows);
  - What will be paid for each option and when payments will be made;
  - How individual agreements will be monitored and enforced.
205. The Project Officer will be responsible for administration of the scheme, farm visits and liaison with land owners, as well as monitoring and enforcement of agreements; and strategic monitoring across the scheme area.
206. The Project Officer hosted by Wiltshire Council will be responsible for undertaking, or facilitating, the following strategic monitoring:
- Quantum and condition of habitats enhanced or created as part of the scheme for bat target species;
  - Continuing to develop the evidence base within red and yellow zones shown on Figure 4 (e.g. through radio tracking of lesser and greater horseshoe bat);
  - Long-term monitoring of bat populations, particularly numbers of Bechstein's bat associated with the core woodland maternity sites.
207. It is recognised that at this stage, there will be uncertainty in terms of which specific habitat enhancement, restoration or creation opportunities can be delivered and where, as most if not all land is within private ownership; and delivery therefore depends on engagement with land owners. As such, a multitude of potential opportunities will be identified taking a whole landscape approach to ensure there is sufficient scope to deliver the agreed quantum of habitat enhancement, restoration and creation improvements.

### 9.1.2 Developer contributions for strategic habitat mitigation

208. Any development of new greenfield (namely the draft Wiltshire Housing Site Allocation Plan sites, neighbourhood plan or exception sites; and other uses consistent with WCS policies) located within the yellow Medium Risk Bat Sensitivity Zone (see Figure 4) must, where appropriate, expect to contribute to strategic habitat mitigation via a section 106 agreement (S106) as follows:

- For residential development, £777 per dwelling, which will be payable through S106;
- For all other development types, £23,310 per hectare which will be payable through S106.

209. The calculation which sets out the basis for these contributions is set out in full within Appendix 1.

## 9.2 Recreational Pressure Mitigation

210. The Footprint Ecology Report (November 2018) was commissioned by Wiltshire Council to consider recreation on the nature conservation interest of woodland near to Trowbridge. The report sets out a series of recommended measures aimed at avoiding and mitigating the impacts of increased recreational pressure arising from new residential development at Trowbridge on important woodland bat sites. The measures that Wiltshire Council intends to take forward through implementation of this document have been summarised below.

211. Footprint Ecology recommends that a 600m exclusion zone is established around important bat woodlands where residential development should be restricted (i.e. no net increase in new residential curtilage within the zone). This recommendation has been implemented in full within this document.

212. Other recommended mitigation and avoidance measures within the Footprint Report that will be adopted through implementation of this Mitigation Strategy have been summarised below. The recommended costed measures to be implemented through this strategy have been itemised separately in Appendix 2. Note that it is the measures set out in Section 9.2 that will be the focus of implementation of this Strategy (the measures set out in Section 9.2.1 are critical, however, they will largely be implemented through the s106 agreement associated with the Ashton Park planning permission).

213. It should be noted that new housing allocated through the HSAP together with other residential development (windfall development in the urban area, neighbourhood plan or exception sites) could result in a total of 2107 additional dwellings for an estimated 4,846 people by 2026 (based on the average of 2.3 people per household (Office for National Statistics, 2018) if the WCS requirement is met (see Table 1 above). Working on the basis of 8ha green open space per 1,000 people (Footprint Ecology, November 2018), this means that an extra 38.8 ha of green space capacity needs to be provided in association with this level of additional development. In practice, as reflected in the Footprint Ecology recommended measures, green space capacity can be created through the implementation of different measures. However, due to the need for certainty, a precautionary approach has been taken to calculate the maximum cost per new dwelling, which is based on the creation of a new SANG for the full 38ha (i.e. the costliest measure) has been allowed for. This indicates that an allocation of up to £641 per new dwelling would need to be available from Community Infrastructure Levy to ensure mitigation measure can be created for the increase in recreational pressure (See Appendix 2).

214. However, it is likely that Wiltshire Council will adopt a 'mix and match' approach to select a variety of measures for implementation that can best-deliver the required capacity over the next 7 years, including enhancement of existing green spaces and work towards developing a new country park (or SANG) if necessary. The size of any SANG needed would reflect any recreational pressure not addressed through enhancement of existing green spaces. The measures in paragraph 228 may well

be more cost effective in delivering reductions in visitors to the woods concerned than by SANG creation alone. The project officer will develop an appropriate method for comparing the efficacy of the measures adopted to ensure that the increased recreational pressures are effectively and adequately mitigated.

#### 9.2.1 Recognising important bat woodlands as nature reserves

##### 9.2.1.1 *Limiting parking*

215. Additional parking in the general vicinity of the woodlands is unlikely to be acceptable due to the increased risk to the bat populations from higher visitor numbers

##### 9.2.1.2 *New interpretation and signage at the woodland bat sites*

216. Interpretation provides information for visitors about the site, while signage informs visitors as to how to behave and helps way-finding. The two can be linked. New interpretation and signage would ensure visitors are aware the sites are important and managed for nature conservation, as distinct from the other greenspace sites which are managed primarily for access. There should be clear instructions/guidance relating to the issues of fires, camping, remaining on paths, dog fouling, dogs off leads etc. Improved way-marking will help people follow particular routes through the woods. As Bechstein's bats regularly move roost sites, it is likely that disturbance will be minimised if the area used for access is minimised. Focusing access on selected paths and reducing desire lines is therefore likely to be beneficial, and good way-marking within the woods may help achieve this.

217. In addition, the Green Lane Wood complex comprising Green Lane Wood, Biss Wood and the Green Lane Nature Park needs careful branding to ensure visitors clearly distinguish between the different purposes of each separate area (i.e. ensuring a clear separation between areas where there is a nature conservation focus and those areas where the focus is access and recreation). This will be resolved through the new iteration of the Green Lane Wood Complex Management Plan which will be funded by the Ashton Park developer following grant of planning permission for Ashton Park. Only in exceptional circumstances would new signage and interpretation be funded through contributions from other developments besides those from Ashton Park.

##### 9.2.1.3 *Improvements to paths within the woodland bat sites*

218. Improvements to path surfacing/routes at woods should also help focus access within the woodland sites and limit desire lines/spread of access within the sites. Improvements should be low key, with the aim of containing access along particular routes and keeping areas of the wood quiet, rather than enhancing the sites to draw more visitors. Improvements to the path network should ensure the woodland sites are more robust in terms of absorbing any changes in recreation use in the future.

219. Given the erratic nature of roosts sites and the limited knowledge of the full picture of roost sites in the woods, there is little evidence as to where the paths should be directed. But it is nevertheless recommended that any revisions to the path networks should consider the possible effect of pushing or pulling visitors to different parts of the sites near bat roosts or the habitat potential for roosts. Changes to paths should be agreed in liaison with the expert bat workers who undertake monitoring of roosts and bat boxes within the woods. The principles for locating and maintaining the path network in the Green Lane Wood Complex will be considered in the next iteration of the Management Plan. Only in exceptional circumstances would path repairs etc be funded through contributions from other developments besides those from Ashton Park.

##### 9.2.1.4 *Fencing at woodland bat sites*

220. From evidence gathered through stakeholder interviews there is a need for improvements to fencing and new fencing around the woodland sites. Fencing serves two purposes. Management of deer within the woodlands is difficult where there is access, and therefore impacts of deer are likely in the long term to be resolved by keeping deer out rather than culling. This will reduce damage to ground flora, coppice regrowth and overall woodland structure, and is particularly relevant at Biss Woods. Fencing also serves to limit desire lines and stops diffuse access; visitor use is then focused through gates and main paths, meaning signage, interpretation and engagement can be more effectively targeted and visitors are funnelled onto the main paths. This is particularly relevant along the western edge of Green Lane Wood. Fencing principles should be considered in the next iteration of the Management Plan. Only in exceptional circumstances would fencing be funded through contributions from other developments besides those from Ashton Park.

#### 9.2.1.5 *Increased warden presence at woodland bat sites and other greenspace sites*

221. The granting of planning permission for Ashton Park requires the provision of a full-time dedicated warden employed by Wiltshire Wildlife Trust. The warden's duties will be defined in the S106 agreement and will essentially seek to balance visitor and wildlife needs, with particular emphasis on enhancing conditions for Bechstein's bats. There will be an element of policing to avoid informal fire making, camping, dogs being out of control etc but also an emphasis on engagement to foster a fuller appreciation of the area by local residents and visitors.

#### 9.2.1.6 *Engagement with visitors and the community*

222. Engagement work with visitors and the local community (including schools), will be undertaken by Wiltshire Wildlife Trust through arrangements agreed with Wiltshire Council and the developer through the grant of permission for Ashton Park. Such activities will likely include:

- Information packs to local schools
- Visits to local schools
- Community events
- Engagement events on sites
- Guided walks (e.g. with bat detectors)
- Material on the web, with material on local bats (e.g. showing tracking results)
- Establishing volunteer wardens or 'ambassadors' to help spread key messages such as dogs on leads or the need to pick-up dog mess.
- Volunteer groups, for example helping with tree planting

#### 9.2.1.7 *Provision of outdoor learning space for schools*

223. Linked to the previous recommendation, stakeholder interviews highlighted the need for an outdoor learning space for the Castle Mead school and potentially other schools. Local schools already visit the woods and such use is likely to increase in the future, adding to the pressures on the woods. Provision of facilities for the schools will evolve over time and will be funded through the agreements entered into for the Ashton Park and Castle Mead developments. Outdoor learning space would need to be sited away from areas that support bat roosts and therefore potentially outside the woodland bat sites, yet woodland cover is ideal for these 'forest schools'. Green Lane Nature Park could be a suitable venue. Equally it may be possible for the scout's Jubilee Wood to be shared with the school, which already has many of the provisions needed and is developing into a pleasant woodland space. This would require liaison between the school and scout groups.

## 9.2.2 Infrastructure enhancements to other greenspace sites

224. The visitor surveys targeted a range of greenspace sites away from the bat woodlands. It is clear these are well visited already. Enhancements to these sites could enable them to absorb additional recreational use and for much recreational pressure to be focused on these sites in the future. The visitor survey results provide much information to help guide potential enhancements to draw use away from the woodlands. Dog walking is the main activity at all sites (79% of interviewees) but accounted for a particularly high proportion of visitors at Clanger and Picket Woods (91%). Dog walkers should therefore be a key target group.
225. The visitor survey results show that visitors to the woodland bat sites tended to undertake longer visits compared to other sites (at Biss Wood and Clanger and Picket Woods in particular). The woods also have a relatively high proportion of people visiting infrequently (less than once a month) and at weekends, and therefore it would seem the woods currently draw people who wish to undertake a longer walk and who occasionally make the effort to visit such sites in order to have a longer walk. Clanger has a particular draw for people who come by car, and therefore are making a particular effort to visit. People tended to travel further to Clanger and Picket Woods compared to other sites (potentially reflecting the high proportion of car-users at the site). In contrast, Green Lane Wood has a significantly higher proportion of interviewees who have been visiting for relatively short periods of time, and therefore it is clear that the woodland sites are attracting new visitors and new housing will result in increased levels of use. Routes walked were longer at Clanger and Picket and Green Lane Wood compared to the other sites – at both these locations visitors were typically walking around 2.5km, where none of the other sites had median route lengths above 2km (although Southwick Country Park was just under 2km – the length of the surfaced path.).
226. Looking at the other greenspace sites, Southwick Country Park was notable in the high numbers of people travelling to the site by car, but it is clear that there are sometimes issues at this site with parking capacity, with the current car-park limited to around 40 spaces. While the other non-woodland greenspaces lacked a formal car park for site visitors.
227. 'Close to home' was less of a driver influencing site choice at the woodland bat sites compared to other greenspace sites. People appear to select the woods (compared to other sites) because they are good for the dog/dog enjoys it, because they don't have many other people and because they are quiet (e.g. no traffic noise). The woods also seem to perhaps have more of a rural/wild feel and are more suitable in certain weather conditions (i.e. providing shade). For the other greenspace sites to provide an alternative to the woods, they should therefore be enhanced to provide these characteristics.
228. Ideally the other greenspace sites will function as a network, providing a range of different opportunities, thereby ensuring visitors have a variety of potential sites to visit. Across the network the following features could therefore be provided and maintained (not at all locations but rather at one or more locations), with the aim to enhance access provision and draw visitors away from the woods, taking care not to create too urban a feel across the sites:
- Fenced dog training area, drawing dog walkers with unruly dogs or those with new dogs. For example, at Southwick Country Park, where interviewees suggested dog behaviour is an issue and the improvement could be situated carefully to spread users more.
  - Water for dogs, such as pools or ponds where dogs can swim and have access to water to drink.
  - Dog bins at all sites, near/at main access points.

- Surfaced all weather paths, drawing use in wet weather and when ground conditions are muddy. For example, the western bank of Biss Meadows, which could be encouraged to have more use.
- Provision of longer walking circuits. Longer routes (at least 2.5km) should encompass relatively quiet areas with rural feel (i.e. without lots of people and noise).
- A range of parking locations providing safe, off-road parking, easily accessible and with plenty of space to park (i.e. so visitors that do arrive by car can be confident of being able to park). Additional parking provision is necessary to serve Southwick Country Park and could include the main car-park but also outside the country park to provide additional parking at other locations around the site (e.g. near the allotments or from Studley).
- Café and toilets, particularly at Southwick Country Park, providing for those visitors that wish for such facilities. Café facilities may work to draw visitors who wish to meet socially (e.g. meeting for a walk) and toilets/café may help draw groups. Ideally café facilities should be dog friendly, e.g. with some outdoor seating etc. where dog walkers can sit with their pets.
- Outdoor gym area/facilities for exercise, potentially drawing users who are seeking to exercise and wishing for space to 'get fit'. Fun, amusing gym like facilities for children and adults are enjoyable and combine health benefits of heart rate simulation, rather than solely low heart rate activities, such as walking.
- Creation and management of a range of habitats, particularly ensuring a range of wooded habitats and mix of open areas and woodland, providing good space for dog walkers and others potentially currently attracted to the woods.

### 9.2.3 Signage and interpretation at other greenspace sites

229. Interpretation and signage at other greenspace sites could help to create a different feel and identity from the woodland bat sites, ensuring that visitors recognise a clear distinction between sites where there is nature conservation interest and sites that are primarily managed for access and the benefit of people. Signage and interpretation are likely to help visitors to get the most from their visit.
230. Consistent signage across the other greenspace sites may also help visitors place sites within the context of each other and therefore move more between sites on foot, as there is a feeling of greater connectivity between sites.

### 9.2.4 Creation of additional green infrastructure (SANG)

231. Suitable Alternative Natural Greenspaces (SANGs) is the term given to greenspaces that are created or enhanced with the specific purpose of absorbing recreation pressure that would otherwise occur at sites designated as European wildlife sites. SANGs are created, or existing greenspaces enhanced to create a SANG, in order to mitigate for the effects of new housing development, absorbing the level of additional recreation pressure associated with the new development.
232. A busy, overcrowded site is unlikely to provide that experience. The extent to which a site feels too busy is likely to be subjective, dependent on the vegetation, views, site lines, noise levels, the shape of the site etc; as such setting a standard for existing sites is a challenge.
233. For a site to be effective as a SANG it must provide an alternative to the site of nature conservation importance that is under pressure, and therefore (at least in part) replicate the experience gained from a visit there. Effective SANGs therefore potentially need to be relatively wild, semi-natural spaces and large.
234. The Footprint Ecology Report found that, currently, the total area of accessible greenspace around Trowbridge is around 278ha, of which 162ha is other greenspace away from the bat woodland

sites. Footprint Ecology considered that some enhancement of existing greenspace sites such as Southwick Country Park can be undertaken to increase their capacity and proposed strategic measures for such capacity enhancement are set out above

235. However, the Footprint Ecology Report concluded that the provision of additional green infrastructure needs to be considered in order to meet benchmarks for levels of accessible greenspace available for new residents. As such, there is a recognised need for new greenspace to be provided in association with new residential development at Trowbridge.
236. However, the Footprint Ecology Report also concluded that it should be possible for such additional greenspace land to be phased over time, and as such this is a long-term measure. Nonetheless, additional green infrastructure should be planned well in advance and implemented strategically to maximise its benefit. It will need to be targeted to match the locations where housing will come forward, such that the greenspace is easily accessible.
237. As a starting point, Wiltshire Council will therefore undertake a site search, assessment and feasibility study to allocate suitable land in the Trowbridge area for Suitable Alternative Natural Greenspaces (SANG). Once suitable land has been identified, Wiltshire Council will seek to either acquire land, or ensure that land is secured, for the purposes of delivery of one or more SANGs. All SANGs to be provided must comply with the quality criteria set out in Appendix 3.

#### 9.2.5 Developer contributions for strategic recreational pressure mitigation

238. Any new residential development located within the grey hatched Medium Risk Bat Sensitivity Zone (see Figure 5) will require an allocation from Community Infrastructure Levy to ensure mitigation measure can be created for the increase in recreational pressure. The contribution for such strategic recreational pressure mitigation will be made via CIL as follows:
- For residential development, calculated at £641 per dwelling. Developers will not pay this directly, but it will be calculated annually from the number of housing completions and taken from the CIL receipts
239. The calculation which sets out the basis for these contributions is set out in full within Appendix 2. The costs in Appendix 2 have been based on the establishment of acquiring and establishing a new 38ha SANG and hence reflect a 'maximum worst case' scenario.

## 10 BIBLIOGRAPHY

- Andrews Ecology Ltd. (2017). *Bat Tree Habitat Key 2017*. BTHK – Database Report 2017. Bridgwater: Andrews Ecology.
- Aspect Ecology. (August 2017). *Report in respect of Bechstein's Bats (including results of the 2013 radio-tracking study)*.
- Barataud, M. (2016). *Acoustic Ecology of European Bats: Species Identification, Study of their Habits and Foraging Behaviour*. Inventaires Et Biodiversite.
- Bat Conservation Trust (BCT). (2015, 01 01). *BCT National Bat Monitoring Programme (NBMP) - Results and Reports*. Retrieved 08 10, 2016, from [http://www.bats.org.uk/pages/results\\_and\\_reports.html](http://www.bats.org.uk/pages/results_and_reports.html)
- Bat Conservation Trust. (2009). *BATS AND LIGHTING IN THE UK*. London: Bat Conservation Trust.
- Bat Conservation Trust. (2016). *Bat Survey Guidelines for Professional Ecologists: Good Practice Guidelines* (3rd ed.).
- Bat Conservation Trust and Institution of Lighting Professionals. (2018). *Guidance Note 08/18. Bats and Artificial Lighting in the UK. Bats and the Built Environment Series*.
- Bates, F. (2010). *The impact of hedgerow management on organic and conventional farms on small mammals, bats and their insect prey*. . PhD Thesis , University of Bristol .
- Bath and North East Somerset Council. (2018). *Waterways Design Guidance Protecting Bats in Waterside Development*.
- Billington, G. (2000). *Radiotracking study of greater horseshoe bats at Mells, near Frome, Somerset*. English Nature, Peterborough.
- Billington, G. (2003). *Radiotracking study of greater horseshoe bats at Buckfastleigh Caves, Site of Special Scientific Interest*. English Nature, Peterborough.
- Bontadina, F. e. (2002). Radio-tracking reveals that lesser horseshoe bats (*Rhinolophys hipposideros*) forage in woodlands. *Journal of Zoology*, 258(3), 281-290.
- Boughey, K. e. (2011). Effects of landscape-scale broadleaved woodland configuration and extent on roost location for six bat species across the UK. *Biological Conservation* , 144, 2300-2310.
- Boughey, K. e. (2011). Improving the biodiversity benefits of hedgerows: How physical characteristics and the proximity of foraging habitat affect the use of linear features by bats. *Biological Conservation* (144), 1790-1798.
- British Standards Institute. (2013). *BS 42020:2013 Biodiversity - Code of practice for planning and development* (First ed.). London: BSI.
- British Standards Institute. (2015). *BS 8596:2015 Surveying for bats in trees and woodland. Guide*. British Standards Institute.
- Bruce-White, C. S. (2011). *A review of the impact of artificial light on invertebrates*. Retrieved from Buglife: [https://www.buglife.org.uk/sites/default/files/A%20Review%20of%20the%20Impact%20of%20Artificial%20Light%20on%20Invertebrates%20docx\\_0.pdf](https://www.buglife.org.uk/sites/default/files/A%20Review%20of%20the%20Impact%20of%20Artificial%20Light%20on%20Invertebrates%20docx_0.pdf)
- Cohen, K. (2017). *Castlemead s.106 Ecology Monitoring Report: Green Lane & Biss Woods 2016*.
- Cohen, K. (2018). *Castlemead s.106 Ecology Monitoring Report: Green Lane & Biss Woods 2017*.
- Cresswell Associates. (2004). *Bats in the Landscape Project*. The National Trust, Sherborne Park Estate.
- Dekeukeleire, D. e. (2016 ). Swarming behaviour, catchment area and seasonal movement patterns of the Bechstein's bats: implications for conservation. *Acta Chiropterologica*, 349–358.
- Department for Communities and Local Government. (2012, 03 27). *NATIONAL PLANNING POLICY FRAMEWORK 2012*. Retrieved from [www.gov.uk](http://www.gov.uk): [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/6077/2116950.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf)
- Downs, N. e. (2006). The use by bats of habitat features in mixed farmland in Scotland . *Acta Chiropterologica* , 8, 169-85.
- Downs, N. e. (2006). The use by bats of habitat features in mixed farmland in Scotland . *Acta Chiropterologica*, 8(1), 169-185.
- DTA Ecology. (July, 2017). *Shadow Appropriate Assessment under the Habitats Regulations of Ashton Park planning application 15/04736/OUT ADDENDUM*.
- DTA Ecology. (Oct 2016). *Shadow Appropriate Assessment under the Habitats Regulations of Ashton Park planning application 15/04736/OUT*.
- Duverge, P. e. (2003). *Use of farmland habitats by greater horseshoe bats*. (F. e. Tattersall, Ed.) London: The Linnean Society London.
- Emery, M. (2008). *Effect of street-lighting on bats*. Project Report, Urbis Lighting Ltd.
- Entwistle, A. e. (n.d.). *Habitat management for bats* . 2001, Joint Nature Conservation Committee.
- European Council. (1992, May 21). Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
- Footprint Ecology. (Oct, 2017). *Trowbridge Visitor Survey and Recreation Management Strategy*.
- Fure, A. (2006). *Bats and lighting* . The London Naturalist .
- Fure, A. (2012). Bats and lighting - six years on. *The London Naturalist*, 69-88.
- Gunnell, K., Murphy, B., & Williams, C. (2013). *Designing for Biodiversity: A technical guide for new and existing buildings* (Second ed.). London: RIBA Publishing.



- Harris, G. L. (March 2017). *Mammals in Wiltshire Second Edition*. Wiltshire and Swindon Biological Records Centre, Wiltshire Mammal Group and Wiltshire Bat Group.
- Harris, S., Cresswell, P., & Jefferies, D. (1989). *Surveying Badgers* (1st Edition ed.). London: Mammal Society.
- Hill, D. A. (2005). Effectiveness of an acoustic lure for surveying bats in British woodlands. *Mammal Review*.
- Joint Nature Conservancy Council. (2010). *Handbook for Phase 1 habitat survey*. London: JNCC.
- Jones, G. e. (2015). *Greater horseshoe bats and their insect prey: the impact and importance of climate change and agri-environment schemes*. University of Bristol, School of Biological Sciences.
- Jones, J. (n.d.). *Impact of lighting on bats*. London Biodiversity Partnership.
- Knight, T. (2006). *The use of landscape features and habitats by the lesser horseshoe bat (Rhinolophus hipposideros)*. PhD thesis, University of Bristol.
- Knight, T. a. (2009). Importance of night roosts for bat conservation: roosting behaviour of the lesser horseshoe bat *Rhinolophus hipposideros*. *Endangered Species Research*, 9, 79-86.
- Limpens, e. a. (1991). Bats, their behaviour and linear landscape elements. *Energy Procedia*.
- Limpens, H. e. (1991). Bats, their behaviour and linear landscape elements. *Mytosis*(29), 39-48.
- Macdonald, D. e. (2015). *Wildlife Conservation on Farmland*.
- Middleton, N., Froud, A., & French, K. (2014). *Social Calls of the Bats of Britain and Ireland*. Pelagic Publishing.
- Miller, H. (2011). *Bechstein's Bat Survey, Final Report, September 2007 - September 2011*. Bat Conservation Trust.
- Mitchell-Jones, A. J. (2004). *Bat Mitigation Guidelines*. English Nature.
- Natural England and the Commission for Rural Communities. (2006). *Natural Environment and Rural Communities (NERC) Act 2006 c.16*. London: The Stationary Office.
- North Somerset Council. (January 2018). *North Somerset and Mendip Bats Special Area of Conservation (SAC) Guidance on Development: Supplementary Planning Document*.
- Office for National Statistics. (2018, September 20). *Household projections for England, comparisons with other sources: 2001 to 2018*. Retrieved from Office for National Statistics: <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/articles/householdprojectionsforenglandcomparisonswithothersources/2001to2018>
- Palmer, E. P. (2013). *A study on the population size, foraging range and roosting ecology of Bechstein's bats at Grafton Wood, SSSI, Worcestershire*. A report to The People's Trust for Endangered Species and Worcestershire Wildlife Trust, by Link Ecology & Swift Ecology.
- Pegasus Group. (August, 2017). *Ashton Park, Trowbridge Environmental Statement - Adendum Volumes 1 & 2*.
- Ransome, R. D. (1997). *The management for greater horseshoe bat feeding areas to enhance population levels*. English Nature Research Reports Number 241.
- Rich, C. e. (Ed.). (2006). *Ecological Consequences of Artificial Night Lighting*.
- Russ, J. (2012). *British Bat Calls: A Guide to Species Identification*. Pelagic Publishing.
- Russ, J. e. (2002). Habitat associations of bats in Northern Ireland: implications of conservation. *Biological Conservation*, 108, 49-58.
- Rydel, J. e. (1996). *Bats and Streetlamps*. Bats Magazine.
- Rydel, J. (1996). *Bats and Streetlamps*. Bats Magazine.
- Stone, E. (2013). *Bats and lighting: overview of current evidence and mitigation*. University of Bristol.
- Stone, E. (2013). *Bats and lighting: Overview of current evidence and mitigation*. University of Bristol.
- Stone, E. L. (2009). Street lighting disturbs commuting bats. *Curr. Biol.*, 1123-1127.
- Stone, E. L. (2015). The impacts of new street light technologies: experimentally testing the effects on bats of changing from low-pressure sodium to white metal halide. *Philos. T. R. Soc. B*.
- Stone, E. L. (n.d.). Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats. *Glob. Change Biol.*, 2458-2465.
- Trust, B. C. (2014). *Artificial lighting and wildlife. Interim guidance: recommendations to help minimise the impact of artificial lighting*.
- UK Government. (1981). *The Wildlife and Countryside Act 1981(WCA 1981) as in force today (including any amendments) within the United Kingdom, from*. Retrieved from [www.legislation.gov.uk](http://www.legislation.gov.uk): <http://www.legislation.gov.uk/ukpga/1981/69>
- UK Government. (1992, 01 01). *Legislation.gov.uk - Protection of Badgers Act 1992*. Retrieved from [Legislation.gov.uk](http://www.legislation.gov.uk): <http://www.legislation.gov.uk/ukpga/1992/51/contents>
- UK Government. (2006, 05 02). *Legislation - Natural Environment and Rural Communities Act 2006*. Retrieved from [Legislation.gov.uk](http://www.legislation.gov.uk): <http://www.legislation.gov.uk/ukpga/2006/16/contents>
- UK Government. (2017, 10 31). *Conservation of Habitats and Species Regulations 2017*. Retrieved 05 16, 2018, from [www.legislation.gov.uk](http://www.legislation.gov.uk): <http://www.legislation.gov.uk/uksi/2017/1012/contents/made>

UK Government. (2018, 07). *Gov.uk - Publications - National Planning Policy Framework*. Retrieved from [www.gov.uk: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/740441/National\\_Planning\\_Policy\\_Framework\\_web\\_accessible\\_version.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740441/National_Planning_Policy_Framework_web_accessible_version.pdf)

Waring, S. (2012, 01 01). *Bats and Breathable Roofing Membranes - BSA2012 paper - submission*. Retrieved from Bats and Breathable Roofing Membranes: <http://www.batsandbrms.co.uk/literature.php>

Wiltshire Bat Group. (December 2016). *Newsletter Winter 2016*.

Wiltshire Bat Group. (February 2018). *Newsletter Spring 2018*.

Wiltshire Council. (2015). *Wiltshire Core Strategy. Adopted January 2015*.

Wiltshire Council and Swindon Borough Council. (November 2017). *Swindon and Wiltshire Joint Spatial Framework Issues Paper*.

Wiltshire Council. (April 2014). *Wiltshire Core Strategy Updated Habitats Regulations Assessment*.

Wiltshire Council. (February, 2018). *Habitats Regulations Assessment, Ashton Park (Final Version)*.

Wiltshire Council. (July, 2018). *Wiltshire Housing Site Allocations Plan. Submission Draft Plan*.

Wiltshire Council. (June, 2017). *Wiltshire Housing Site Allocations Plan Pre-Submission Draft. Assessment under the Habitats Regulations*.

Wiltshire Council. (March, 2018). *Housing Land Supply Statement. Base Date: April 2017*.

Wiltshire Council. (May, 2018). *Addendum to 'Wiltshire Housing Site Allocations Plan Pre-Submission Draft (June 2017) Assessment under the Habitats Regulations'*.

Wiltshire Council. (November, 2017). *Wiltshire Local Plan Review Consultation Paper*.

Wiltshire Council. (September, 2015). *Bat Special Areas of Conservation (SAC). Planning Guidance for Wiltshire*.

Wray, S. (2010, December). *Valuing Bats in Ecological Impact Assessment. In Practice*, 23.

Wright, P. G.-W. (2018, August). *Genetic structure and diversity of a rare woodland batm Myotis bechsteinii: comparison of continental Europe and Britain. Conservation Genetics*, pp. 777-787.

WSP. (February, 2012). *Wiltshire Core Strategy Submission Draft - Assessment under the Habitats Regulations*.

WSP. (March 2013). *Wiltshire Core Strategy: Assessment under the Habitats Regulations*.

Zeale, M. R., Davidson-Watts, I., & Jones, G. (2012). *Home range use and habitat selection by barbastelle bats (Barbastella barbastellus): implications for conservation. Journal of Mammology*, 93(4), 1110-1118.

## APPENDIX 1 COSTED HABITAT MITIGATION

Habitat	Works	Item	Total minimum target (ha)	Unit cost (£)	Unit	Total cost (£)	Period (years)	Annual cost	Capital cost	Source of costs	Comments on application of grant (3)	Comments on calculation assumptions
Broad-leaved woodland	Woodland creation	Total cost estimate for category	6			282,330		7,680	228,570	2		6 ha of new woodland will be delivered within the risk zones to compensate for residual and in-combination effects arising from development. 6 ha will deliver a 5% increase in the area of the high quality woodland habitat upon which the local Bechstein's population depends.
		Detailed breakdown										
		Land acquisition	6	22,500	per ha	135,000			135,000			At the close of 2017, Savills GB Farmland Value Survey shows average prime arable commanded close to £9,000 per acre, with average grade 3 farmland trading at £7,500 per acre. 12 Feb 2018 ( <a href="https://www.savills.co.uk/research_articles/229130/228020-0">https://www.savills.co.uk/research_articles/229130/228020-0</a> )
		Prepare Woodland Creation Plan	6	1,200	per woodland plan	7,200	N/A		7,200		Assumes woodland will be planted in minimum blocks of 1 ha.	
		Woodland site preparation: subsoiling, fertiliser & herbicide	6	450	per ha	2,700	N/A		2,700	2		
		Hand planting bare-rooted broad-leaves	6	350	per ha	2,100	N/A		2,100	2		
		Additional to fit stakes and tubes to broad-leaves	6	350	per ha	2,100	N/A		2,100	2		
		Materials: bare-rooted trees	6	495	per ha	2,970	N/A		2,970	2		
		Materials: tubes & stakes	6	2,750	per ha	16,500	N/A		16,500	2		
		Deer fencing for new woodland planting	2400	25	per metre	60,000	N/A		60,000	3	Assumes woodland will be planted in minimum blocks of 1 ha.	Estimated costings subject to uplift to allow for contractor OH and profits
		Annual payment to maintain woodland planting	6	1,280	per ha	53,760	7	7,680		3	To include beating up, weeding & herbicide application.	Assumes most maintenance will be required in first 5 years, after which a general annual maintenance payment will be required. Assumes beating up will require replacement of 10% of failures; herbicide 'spot' application will be required 1x per annum in first 5 years; weeding required x 2 in first 5 years.

Hedgerows	Creation	Total cost estimate for category	11 km			349,932		15,554	303,270		Aim is for all restored or newly planted hedgerows to be double fenced to 3m width, with standards. Must include the cost of initial maintenance for 3 years after planting, to include removal of any tree guards and shelters, 'beating up' (replace all failures in the following planting season), and trim the newly planted hedge in at least the first 2 years to encourage bushy growth, allowing the hedge to become taller and wider at each cut	Based on comments from Natural England dated 31/8/18. 11km of new (or 22km of enhanced) hedges – far enough to provide a single new connective corridor from Southwick Country Park to Green lane wood, assuming 100% establishment success rate and a 33% loss over the longer term, and a 1.2 temporal multiplier (assuming hedges are delivering benefits after 5 years):
		Detailed breakdown										
		Excavate trench for hedges	11000m	6.93	per m	76,230	N/A		76,230	2		Trench excavated by machine. Trench 500mm deep x 700mm wide.
		Plant hedge	11000m	9	per m	99,000	N/A		99,000	3		Assumes backfill with excavated topsoil. Assumes hedges to be planted with bare root whips, in a double row with 200mm centres
		Plant standard trees	220 trees	32	per tree	7,040	N/A		7,040	4	1 standard tree per 50m (as per Important Hedgerow criteria in the Hedgerow Regulations)	Assumes light standard (tree girth of 6-8cm) bare root tree in tree pit measuring 600x600mm deep. Includes excavation of pit by machine, fork over bottom of pit, plant tree with roots well spread out, backfill with excavated material, incorporate organic manure, 1 tree stake and 2 ties.
		Stock proof fencing (2 sides)	11000m	5.5	per m	121,000	N/A		121,000	3		
		Initial payment to maintain new hedgerows	11000m	1,414	per km	46,662	3	15,554		3	To include beating up, weeding & herbicide application. Initial maintenance assumed as required for 3 years following planting. Assumes replacement of failures at 10%.	Extrapolated approximately from per ha costs (assumes 1 km = 1ha)
Hedgerows	Long-term management	Total cost estimate for category	11km			9240		1,320				
		Detailed breakdown										
		Compliance with hedgerow management specification	16.5km	8	100m	9240	7	1,320		5	Maintain hedges at least 3m tall and 2m wide. Cut no more than 1 year in 3 (leave at least 2/3 of hedges untrimmed each year). Cut between 1st January and 28 February. Cut incrementally, rather than trimming back to the same point, aiming to allow hedges to increase in height and width by several centimetres at each cut	Assumes grant would be paid over a 10 year period. The total 10 year cost has therefore been averaged over the 7 years for which these costings are estimated to cover).

3 Agro Business Consultants (May, 2018). The Agricultural Budgeting & Costing Book No 86

4 Based on: (Aecom) (Ed) (2016) SPON'S External Works and Landscape Price Book 35th Edition.

5 Based on: Forestry Commission, Natural England (Revised July 2018) Countryside Stewardship Mid Tier Options, Supplements and Capital Items [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/723365/mid-tier-options-supplements-capital-items-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/723365/mid-tier-options-supplements-capital-items-2018.pdf)

Administration, implementation, enforcement and monitoring						175,000		25,000					
		Detailed breakdown											
		Part-time project officer				105,000	7	15,000				Assumes £30,000 annual salary, including on-costs. Assumes 2.5 days per week. Costs cover this post for 7 years (the plan period)	
		Fund for monitoring				70,000	7	10,000				e.g. to cover consultant's radio-tracking fees, bat detector equipment	
<b>Contribution Per Dwelling</b>								<b>£777.62</b>	N.B. This equates to £23,310 per ha commercial development (contribution based on the equivalent of 30 dwellings per ha of developed element of the site excluding land set aside for onsite mitigation) to mitigate against in-combination effects on ALL new greenfield developments within the bat sensitivity zones after achieving no net loss on site. To include (but not restricted to) all new developments: within the Sites Allocations plan, Neighbourhood plans, Rural exception sites. The calculation uses the sites allocation figure (1,050) as set out in Table 4)				

General assumptions

Allocations within the Wiltshire Housing Site Allocations Plan will be delivered over the period 2019 to 2026 (and therefore payments for habitat improvement payments will be made during this 7-year period)

The core woodland block area has been calculated by summing the area of Green Lane, Biss and Clanger and Pickett Woods (120 ha in total).

Units as per column headings unless otherwise stated.

## APPENDIX 2 COSTED RECREATIONAL PRESSURE MITIGATION

Mitigation measures	Potential location	Approximate total cost	Comments on source of costings	Assumptions for costings
<b>New SANG site</b>				
Land acquisition	Countryside surrounding Trowbridge	£855,000	At the close of 2017, Savills GB Farmland Value Survey shows average prime arable commanded close to £9,000 per acre, with average grade 3 farmland trading at £7,500 per acre. 12 Feb 2018. <a href="https://www.savills.co.uk/research_articles/229130/228020-0">https://www.savills.co.uk/research_articles/229130/228020-0</a>	38 ha of SANG capacity is required in accordance with recommendations in Footprint (November 2018). Trowbridge Visitor Survey and Recreational Mitigation Strategy)
New SANG infrastructure				Costs are very approximate and need to be recalculated on a site-specific basis, using costings requested from contractors.
Surfaced paths	New SANG site	£74,250	Based on: Contractor's pricing (Keffen Civils Groundwork Contractors) for SANG path works in Dorset, 2018	Assume 2.5km of all-weather path suitable for all abilities. Assume paths are 1.8m wide, no edging. 50mm thick self-binding aggregate on 150mm type 1 (crush concrete); non-woven geotextile membrane. Excavated spoil left next to path
Gravel pathways	New SANG site	£37,500	Based on: (Aecom) (Ed) (2016) SPON'S External Works and Landscape Price Book 35th Edition.	Assume 2.5km of less formal gravel path, 1m wide. No edging to path
Signage and interpretation	New SANG site	£17,500	Panter, C., Lake, S., & Liley, D. (2017). Trowbridge Visitor Survey and Recreation Management Strategy. Unpublished report by Footprint Ecology for Wiltshire Council	Costs are very approximate and need to be recalculated on a site-specific basis, using costings requested from contractors. 5 AO interpretation panels at £3000 each. 25 softwood marker posts at £80 per post. £500 for discs made of glass reinforced plastic. Signage needs to be consistent and carefully branded.
Habitat creation (woodland planting)	New SANG site	£47,580	Agro Business Consultants (May, 2018). The Agricultural Budgeting & Costing Book No 86	Assume planting 4 ha. Assume £11,895 per ha, inclusive of ground preparation, planting, materials and deer fencing (cost per ha taken from the habitat enhancement costings spreadsheet)
Car park	New SANG site	£68,399	Based on: (Aecom) (Ed) (2016) SPON'S External Works and Landscape Price Book 35th Edition.	Costs are very approximate and need to be recalculated on a site-specific basis, using costings requested from contractors. No costs included for vegetation clearance, preliminaries or contractor OH/ profits. Assume additional 30 parking spaces provided, and 2 disabled spaces. Assume 440m2 gangway. Assume 130m of block paving edging. Assume 20m Macadam roadway from highway junction for car park.
Dog bins x 3	New SANG site	£450	Panter, C., Lake, S., & Liley, D. (2017). Trowbridge Visitor Survey and Recreation Management Strategy. Unpublished report by Footprint Ecology for Wiltshire Council	
Benches	New SANG site	£12,627	Based on: (Aecom) (Ed) (2016) SPON'S External Works and Landscape Price Book 35th Edition.	Assumes 6 x timber benches; 3 x timber picnic tables. Assumes bolting into existing paving.
Litter bins x 5	New SANG site	£3,300	Based on: (Aecom) (Ed) (2016) SPON'S External Works and Landscape Price Book 35th Edition.	
Promotion to residents	New SANG site	£5,000		
CIL delivery officer	New SANG site	£210,000	Wiltshire Council	Assumes £30,000 annual salary, including on-costs.
<b>Monitoring</b>				
Monitoring visitor numbers.		£20,000	Panter, C., Lake, S., & Liley, D. (2017). Trowbridge Visitor Survey and Recreation Management Strategy. Unpublished report by Footprint Ecology for Wiltshire Council	Across all greenspace sites. Single visitor survey in Year 5
<b>Total</b>		<b>£1,351,606</b>	This applies to new residential development within the residential pressure zone (see Figure 5).	
<b>Per Dwelling Contribution</b>		<b>£641.48</b>	N.B. the calculation uses estimated residential growth (2,107 dwellings) as set out in Table 1. Most costings provided are generic and where necessary have taken a precautionary approach. Accurate costs can only be calculated on a site-specific basis, taking any site-specific issues into account	

## APPENDIX 3 DESIGN STANDARDS FOR A SANG

- **Location:** needs to be accessible to residents of new development and potentially existing residents, such that the SANG is at least as easy to access as the European sites
- **Size:** sites ideally need to be in the order of 30ha to provide suitably long routes (visitor data from the European sites are necessary to indicate how far people typically walk). There may be potential to link to other sites or rights of way but ideally such route lengths should be entirely accommodated within the SANG.
- **Routes:** a range of routes should be possible, with longer walks (longer than 2.5km) possible. Routes should be easy to find, ideally way-marked and accessible at all times of year.
- **Types of access:** access provision needs to match the requirements of residents and the types of use on the European sites. Dog walkers are likely to be a major component, but requirements are site specific. There are SANGs in Dorset that are designed entirely for BMX riders.
- **Parking:** If the aim of the SANG is to draw people from a reasonable radius, good quality parking will need to be provided. Car parks need to be of appropriate size, free (assuming it is free to park at the European sites) and safe. Dog-walkers will prefer locations where the dog can be let out of the car safely.
- **Feel:** sites should be welcoming, clearly open to the public for access and safe. Adjacent busy roads, sewage works, industrial sites etc. are likely to detract from the appeal of the sites. SANGs should provide a suitable alternative to the ecologically sensitive sites and are therefore likely to need to be relatively wild and semi-natural in feel.
- **Features:** it may be possible to draw visitors and enhance sites with art installations (e.g. sculptures), infrastructure (screens to view wildlife, viewpoints, wild play facilities, benches etc.), however such features should not lead to the site being too urban in feel.
- **Facilities:** large sites may benefit from toilets, a café etc. but such facilities are unlikely to be essential components. Dog bins may be necessary. Some SANGs (e.g. Upton Country Park in Dorset) have dedicated facilities for dog walkers including a fenced dog training area and a stream area where dogs can drink and access the water).
- **Promotion:** it is important that SANGs are widely promoted to local residents. Good road signs, resident's packs, leaflets and promotion on the internet are important.
- **Management:** SANGs need to be permanent and management (e.g. maintenance, grass cutting, path surfacing) needs to be secured in-perpetuity. Some sites are owned by local authorities, other approaches include management by a trust or a suitable charity such as the local wildlife trust.
- **Monitoring:** visitor surveys of SANGs are likely to be necessary in the early days to check sites are being used and drawing the right types of access. Visitor survey results can provide the feedback necessary to modify or enhance the SANG. Any issues (anti-social behaviour, vandalism, poached ground etc.) need to be picked up and resolved.

