2017

Land at Chapel Road Plot, Hereford Enterprise Zone, Rotherwas, Herefordshire Transect Bat Surveys

Mid Wales Ecology

Ecological

Consultants

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LAND AT CHAPEL ROAD,
ROTHERWAS,
HEREFORD
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Produced by:	Joshua Evans BSc, MCIEEM Natural England licence number: 2015-16640-CLS-CLS, WML CL18 (Bat Survey Level 2)		
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Prepared for:	Mr. Daniel Thompson (Herefordshire Council)		
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Summary bat transect survey	During the four bat activity transect surveys and the 15 nights/early mornings of static recording over August to October 2017, the site was found be support at least eight species of bat. Although no European Protected Species License is required at present, given the range of species found on site and especially lesser horseshoe bat, it is strongly recommended that a dedicated biodiversity management plan is created to ensure appropriate management of the site's ecological interest – namely the foraging bats.		

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SUMMARY

Mid Wales Ecology was commissioned by Mr Daniel Thompson (Herefordshire Council) to carry out a transect bat survey on an area of land, Chapel Road Plot, at Hereford Enterprise Zone, Rotherwas Industrial Estate, Hereford. The survey assessment was requested to ensure compliance with National and European legislation.

During the four bat activity transect surveys and the 15 nights/early mornings of static recording over August to October 2017, the site was found be support at least eight species (common pipistrelle, soprano pipistrelle, brown long-eared bat, Daubenton's bat, Natterer's bat, noctule, serotine, and lesser horseshoe bat). In view of the data and the habitats on site, it would appear that the site offers moderate to good foraging capacity, which taken into consideration the young age class of the secondary woodland and its remoteness in what is considered to be an industrialised landscape, is surprising. Given the range of species (*i.e.* at least 8) using an area that is approximately 3.4 hectares, the site clearly represents a significant foraging refuge – either on route to other areas or as a main area for some species.

With regard to the possible proposed works, especially the development of the southern boundary of the site, there are some considerations to take into account prior to development. The site could form part of a core sustenance zone, as per Bat Conservation Trust (2016) for a number of species, despite no known roosts on site or immediately next to it. As a woodland and water habitat, there will be lighting considerations that will need to be carefully planned as to not deter bats from foraging on site.

As lesser horseshoes are found in the local area, it is imperative that the proposed site is maintained and enhanced where possible with the view to secure and enhance the favourable conservation status and resilience of the Wye Valley horseshoe bat populations. This should be done sympathetically towards maintaining flight ways and food sources. Management strategies should be based on sound scientific research and pragmatic solutions. Although no European Protected Species License is required at present, given the range of species found on site and especially lesser horseshoe bat, it is strongly recommended that a **dedicated biodiversity management plan is created to ensure appropriate management of the site's ecological interest** – namely the foraging bats. Given the results of the bat surveys, it would seem more crucial now to produce such a document in order to maintain and where possible enhance the habitat features so as to secure foraging and roosting bat features on the land off Chapel Road.

It should be noted that if more than twelve months elapse between this survey assessment and the commencement of any development then a further survey assessment may be required at an appropriate time to determine the status of any protected species that may have taken up residence during the intervening period.

1. INTRODUCTION

1.1 Commissioning Brief

Mid Wales Ecology was commissioned by Mr Daniel Thompson (Herefordshire Council) to carry out a transect bat survey on an area of land, Chapel Road Plot, at Hereford Enterprise Zone, Rotherwas Industrial Estate, Hereford. The survey assessment was requested to ensure compliance with National and European legislation.

1.2 Summary of the Proposed Development

No proposed works have yet been identified. Possible works may include thinning some trees and create a circular walk around the lake.

1.3 Site Location and description

Location

The subject of this report is an area of land, Chapel Road Plot, which lies towards the east side within the Rotherwas Industrial Estate, Hereford, hereafter referred to as the Site, at: NGR: SO 53565 38034.

The Site adjoins to the south of Chapel Road, and approximately 120m north of the main Rotherwas entrance road of the B4399. The south-east corner of the Site adjoins Fordshill Road which runs north-east from the B4399.

Figure 1 : Site general location 1:50,000

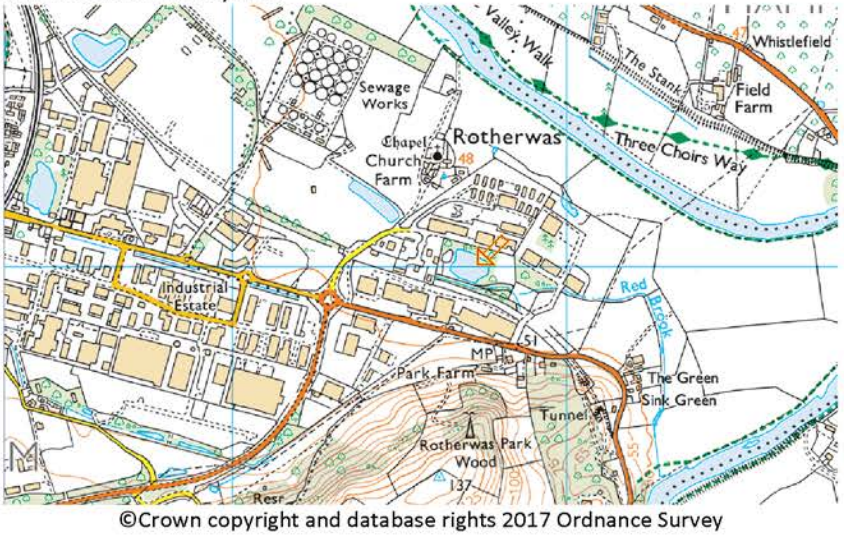

Figure 2: Aerial Photograph showing the Site (shown as red outline).

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Historical Aspects

By reviewing historical Ordnance Survey maps and local research, a historical picture can be built of the site. In 1832, the site was mapped as a field system on the Rotherwas House estate. In 1855 the Hereford and Gloucester Branch of the Great Western Railway was constructed (but this was decommissioned in 1964). This railway did immediately abut the site but today has been built over by a timber yard. In 1881 the site appears to be still fields and abuts the railway and parkland of Rotherwas House of the Bodenham family. The estate included areas of orchard, parkland trees and numerous associated buildings. After the demolition of the house in 1925 due a significant fire, the estate was sold off in 76 lots and some of the chapel graves were removed to the western end of the woodland site but the Catholic chapel remains *in situ*. The land appears to have gone through a period of neglect and the pond was mapped by the 1960's as was part of the woodland, and it would seem that the woodland developed from that time. The 1980 map shows the site as is currently stands but the industrial site itself has developed considerably since then. The pond was used as a private fishing area but this appears to have ceased. The Rotherwas area post the end of Bodenham estate was involved in the war effort in both world wars as a munitions factory. The sewage works commenced in the 1960s and by 1974, the current industrial estate began to develop, which is still going on to the present day. However, reminders of past land use such as Dinedor Camp and the Rotherwas Ribbon still have influence on the current area (Roberts 2002; Shoesmith 2007 and Dinedor Research Group 2014).

Habitat Description

Phase 1 habitat survey

A total of nine habitat types were mapped within the proposed Site development boundary using the Phase 1 categories, listed below (See map Appendix 3).

- Semi-natural broad-leaved woodland (A1.1.1)
- Standing water (G1);
- Scattered scrub (A2.2);
- Scattered broad-leaved trees (A3.1);
- Semi-improved neutral grassland (B2.2);
- Improved grassland (B4);
- Introduced shrub (J1.4);
- Building (J3.6);
- Bare ground (J4).

Semi-natural broad-leaved woodland (A1.1.1)

The main habitat area within the Site comprises of mature broad-leaved woodland, which surrounds the pond. It contains typical established woodland species on more calcareous soils including dominant mature ash *Fraxinus excelsior*, ivy *Hedera helix*, abundant bramble *Rubus fruticosus*, common nettle *Urtica dioica*, frequent mature crack willow *Salix fragilis*, dogwood *Cornus sanguinea*, elder *Sambucus nigra,* hawthorn *Crataegus monogyna*, male fern *Dryopteris flix-mas*, occasional mature birch *Betula* sp., blackthorn *Prunus spinosa*, broad-leaved dock *Rumex obtusifolia*, cow parsley Anthriscus *sylvestris*, dog rose *Rosa canina*, dog's mercury *Mercurialis perennis*, ground-elder *Aegopdium podagraria*, ground-ivy *Glechoma hederacea*, hart's-tongue *Phyllitis scolopendrium*, hazel *Corylus avellana*, hedge bindweed *Calystegia sepium*, herb Robert *Geranium robertianum*, lords-and-ladies *Arum maculatum*, mature pendunculate oak *Quercus robor*, mature sallow *Salix* sp., young sycamore *Acer pseudoplatanus*, traveller's-joy *Clematis vitalba*, wood avens *Geum urbanum*, and rarely guelder rose *Viburnum opulus*, a hemp-nettle *Galeopsis* sp., mature maple *Acer campestre*, seedling Norway maple *Acer plantanoides*, pendulous sedge *Carex pendula*, white bryony *Bryonia cretica*, and seedling yew *Taxus baccata*.

Standing water (G1) and Bare ground (J4)

A large pond is located centrally within the Site surrounded by the mature woodland habitat. Frequent crack willow and occasional sallow overhang the pond edges. The central area of water surface is mostly open water with the edges comprising abundant white water-lily *Nyphaea alba*, with some large stands of emerging abundant reedmace *Typha latifolia* mostly at the eastern end, and rarely a pondweed *Potamogeton* sp. and a water milfoil *Myriophylum* sp. The slightly drier but periodically inundated pond edges comprises some open bare soil/gravel areas with frequent water mint *Mentha aquatic*a, and rarely broad-leaved willowherb *Epilobium montanum*, soft rush *Juncus effusus*, and yellow iris *Iris pseudacorus*.

Semi-improved neutral grassland (B2.2), Scattered broad-leaved trees (A3.1) and Building (J3.6)

A separately fenced neutral grassland meadow, comprising of tall uncut grassland up to 70cm sward height, occurs at the north-eastern corner of the Site. Typically it includes dominant Yorkshire fog Holcus *lanatus*, abundant false oat-grass *Arrhenatherum elatius*, frequent bramble, creeping buttercup *Ranunculus repens*, cock's-foot *Dactylis glomerata*, common nettle, creeping cinquefoil *Potentilla reptans*, creeping thistle *Cirsium arvense*, occasional agrimony *Agrimonia eupatoria*, autumn hawkbit *Leontodon autumnalis*, broad-leaved dock, common bird's-foot trefoil *Lotus corniculatus*, field bindweed, ground-ivy, hogweed *Heracleum sphondylium*, meadow vetchling *Lathyrus pratensis*, tufted hair-grass *Deschampsia cespitosa*, white clover *Trifolium repens*, and rarely common ragwort *Senecio jacobaea*, common sorrel *Rumex acetosa*, dog rose, germander speedwell *Veronica chameadrys*, lesser stitchwort *Stellaria graminea*, meadowsweet *Filipendula ulmaria*, musk-mallow *Malva moschata*, ribwort plantain *Plantago lanceolata*, and spear thistle *Cirsium vulgare*.

The meadow has a row of c.50 planted young to semi-mature alder *Alnus* sp. cultivars along the northern boundary. A single large mature birch occurs towards the north-western corner of the meadow. A small open sided brick pillbox with flat concrete roof c.2m high and adjoining brick walls occurs towards the south-western corner of the meadow adjoining the woodland. The pillbox is overgrown with dominant ivy and overhanging trees from the woodland.

Scattered scrub (A2.2)

The eastern boundary of the meadow contains scattered scrub and tall herbs typically including abundant bramble, frequent creeping thistle, hawthorn, occasional common nettle, cow parsley, false oat-grass, field bindweed *Convolvulus arvensis*, ground-ivy, imperforate St John's-wort *Hypericum maculata*, mugwort *Artemisia vulgaris*, young poplar *Populus* sp., rosebay willowherb *Chamerion angustifolium*, upright hedge-parsley *Torilis japonica*, yarrow *Achillea millefolium,* and rarely herb Robert, seedling Norway maple, seedling pedunculate oak, spear thistle, weld *Reseda luteola*, and wild carrot *Daucas carota subsp. carota*.

Scattered broad-leaved trees (A3.1), Improved grassland (B4) and Introduced shrub (J1.4)

The small spur of land at the south-east corner of the Site is unfenced but mown short by routine cutting. This area has steep earth embankments of 2m height along its northern, southern and eastern sides.

The ground flora is typical of improved grassland with some neutral grassland species, with the steep disturbed banks allowing more seeded herbs. This typically has frequent broad-leaved dock, broad-leaved willowherb, dandelion *Taraxacum officinale*, lesser burdock *Arctium minor*, perennial rye-grass *Lolium perenne*, ribwort plantain, white clover, Yorkshire fog, occasional autumn hawkbit, bramble, common nettle, creeping buttercup, creeping cinquefoil, daisy *Bellis perennis*, greater plantain *Plantago major*, ground-ivy, seedling hawthorn, ivy, prickly sow-thistle *Sonchus asper*, spear thistle, and rarely common bird's-foot trefoil, common ragwort, creeping thistle, field bindweed, herb Robert, selfheal *Prunella vulgaris*, traveller's-joy, upright hedge-parsley, wild carrot, wild teasel *Dipsacus fullonum*, wood avens, yarrow and ornamental shrub cultivars.

Landscape

The Site, approximately 3.4 hectares is located at approximately 45m above Ordnance datum. The Site boundary is roughly rectangular with a small spur of land at the south-east corner, and fenced on all sides by high fencing. A small brick open pillbox is located towards the south-western corner of the north-eastern meadow.

The Site lies approximately 400m to the south-east of the River Wye Special Area of Conservation (SAC).

The Site is located centrally towards the east side within the Rotherwas Industrial Estate. The Site is almost totally surrounded on all sides by commercial/industrial units and associated access roads and parking areas. Adjoining to the north of the Site lies a minor access road, Chapel Road, and the south-east corner of the Site adjoins the minor access road of Fordshill Road. The site is located on second river terrace of the River Wye.

1.4 Scope of the Survey Assessment

The ecological assessment focussed on the following points:

- Determining the potential of the area of the proposed development work to support protected species (in this case bats) of which account must be taken prior to and during the planned works in accordance with the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017.

Furthermore, the survey assessment recommendations are guided by the National Planning Policy Framework[1] (NPPF), where the policies in paragraphs 18 to 219, taken as a whole, constitute the Government's view of what sustainable development in England means in practice for the planning system. The following paragraphs of the NPFF are of particular relevance:

- Paragraph 8 on the roles of planning in relation to sustainable development states: 'These roles should not be undertaken in isolation... therefore to achieve sustainable development economic, social and environmental gains should be sought jointly and simultaneously through the planning system'.
- With regard to paragraph 117, in order to minimise impacts on biodiversity and geodiversity, planning policies should:
  - plan for biodiversity at a landscape-scale across local authority boundaries;
  - promote the preservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species populations, linked to national and local targets, and identify suitable indicators for monitoring biodiversity in the plan;
  - where Nature Improvement Areas are identified in Local Plans, consider specifying the types of development that may be appropriate in these areas.
- With reference to paragraph 118, when determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principals:

[1] National Planning Policy Framework published on 27th March 2012

- if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;
- proposed development on land within or outside a Site of Special Scientific Interest (SSSI) likely to have an adverse effect on a SSSI (either individually or in combination with other developments) should not normally be permitted;
- development proposals where the primary objective is to conserve or enhance biodiversity should be permitted;
- opportunities to incorporate biodiversity in and around developments should be encouraged;
- planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss;

1.5 Desk Study

A search for statutory sites of ecological significance was conducted within a 2km radius of the site using the Multi-Agency Geographical Information for the Countryside website (MAGIC). A data search from Herefordshire Biological Records Service, the local environmental records centre, on existing protected wildlife records was sought within a 1km radius of the Site. Please refer to Appendix 3.

1.6 Survey Constraints

The comprehensiveness of any ecological assessment may be limited by the season in which the site visit was undertaken. To confirm the presence or absence of all bat species usually requires multiple visits at suitable times of the year. Due to the project being commissioned after the bat survey season had started, it was not possible to monitor bat activity from the beginning of the season.

This report cannot therefore be considered to provide a full comprehensive analysis of the ecological interest of the site.

2 METHODOLOGY

Joshua Evans undertook the initial bat survey assessment on 20th August 2017. The weather at 14:00hrs was dry with 30% cloud cover and an air temperature of 20.9°C.

The habitats on site include semi-improved grassland, improved grassland, secondary woodland, scrub and scattered trees along with standing water and running water. The immediate surrounding habitats adjoining the site include commercial properties, hard standing and a running brook (the Red Brook). These habitats were assessed as medium value for foraging/commuting bats. In accordance with the BCT guidelines, transect activity surveys were undertaken on a monthly basis between July and October[2]. In addition, two static detectors (Anabats SD1 and SD2) were positioned along the transects every month within the wooded area

[2] Due to the project being commissioned after the bat survey season had started, it was not possible to monitor bat activity from the beginning of the season. The report highlights data between July and October.

and left to automatically monitor bat activity between dusk and dawn over five consecutive evenings (see Appendix 1). The central tree area was selected to host one of the static detectors due to the security in covering the remote sensors and that is was considered to provide the best foraging habitat on site due to its densest tree cover on site. The other selected area was also in the wooded area but near the standing water. These two areas were determined to offer better foraging opportunities to support a wider range of insect prey and thus support a wider range of foraging bat species.

The bat detectors used throughout the transect surveys were: Pettersson D230 operating in both frequency division and heterodyne modes and Pettersson D240, operating in both time expansion and heterodyne modes. The bat activity surveys on the site were undertaken on the evenings of 20th August 2017, 16th September 2017 and 2nd October 2017 and the pre-dawn survey on 21st August 2017 (combined with the initial evening survey). The survey team consisted of two surveyors on each occasion and was led by Joshua Evans (Natural England bat licence WML CL18 registration number 2015-16640-CLS-CLS) with Phil Ward and/or Craig Powell. The transects are detailed in Map 4.

Table 2.0: Surveyor details and competency

Surveyor Name: Philip Ward MCIEEM		
Competency	Phil has over 30 years experience in wildlife survey and conservation habitat management with various organisations. Over the previous 10 years he has undertaken over 90 phase 1 and extended phase 1 habitat surveys of a wide variety of habitats. He specialises in invertebrates, birds and plants, having undertaken numerous surveys and reports but also carries out surveys on other protected species including amphibians, reptiles and mammals. He is a part time Invertebrate Specialist Tutor with Aberystwyth University and is often called upon to provide training courses for other organisations and education centres. He has held a British Trust for Ornithology (BTO) bird ringing licence since 1987.	
Surveyor Name: Joshua Evans BSc (Hons), MCIEEM		**Licence details:** Natural England bat licence number: 2015-16640-CLS-CLS, WML CL18 (Bat Survey Level 2)
Competency	Joshua has worked as an independent consultant and as part of Worcestershire Wildlife Consultancy. Prior to this he worked for the National Trust and Forestry Commission as an ecological surveyor. For the last 20 years he has worked in both the conservation and consultancy sector. Many of these years were in woodland conservation and management. He is an experienced ecologist with particular expertise in some terrestrial and aquatic invertebrates, amphibians, reptiles and bats and holds Natural England and Natural Resources Wales licences for bats, dormice, great crested newts, white-clawed crayfish and barn owls.	
Surveyor Name: Craig Powell		
Competency	Craig has been undertaken bat surveys with licenced professionals for a number of years for over five years. He has also participated in a number of voluntary conservation organisations.	

3 RESULTS AND DISCUSSION

3.1 Bat Data Search

The results of the data search yielded records of 268 bats within 2km of the proposed works. Identified species included common pipistrelle (38 records), soprano pipistrelles (26 records), brown long-eared bats (22 records), lesser horseshoe bats (51 records), noctule (11 records), serotines (3 records), Daubenton's bat (13 records) and Natterer's bats (17 records) along with numerous unidentified bat species. All records are outside the site but the nearest activity was common pipistrelle approximately 200m north-west and lesser horseshoe bat approximately 350m south-east. Many records pertain to the wider Rotherwas Industrial Estate include common pipistrelle, soprano pipistrelle, Myotid bats, brown long-eared bats, noctules, serotines and lesser horseshoe bats.

As lesser horseshoe bats have been recorded near the site, it is worth investigated the presence of the species in the local area, due to their significance. In Herefordshire, lesser horseshoe bats are recorded, they are rare but more widespread than greater horseshoe bats in the county. There tend to be concentrations around the lower Wye Valley, the Woolhope Dome, the Herefordshire part of the Malvern Hills, the lower end of the Golden Valley and parts of the North-West Herefordshire Hills (Herefordshire Mammal Group 2016 and authors experience of the area). The sporadic records and important nature of horseshoe bats in the county led Herefordshire County Council's Forward Planning Team to develop a Local Development Framework for the county, based on a case example near Ross-on-Wye (Herefordshire Biological Records Centre & Herefordshire Council's Landscape & Biodiversity Team 2010). This was to lead to the development of a Core Strategy and a number of Development Plan documents, which in turn would mean that the Herefordshire County Council would be required to produce a Habitats Regulations Assessment with regard to the implications of future developments and their potential impact on Special Areas of Conservation.

3.2 Site Assessment for Bats & Transect Locations

Secondary Woodland & Standing Water

The main site includes an extensive area of secondary woodland that surround a former fishing pond, that due it drying out, is divided into two sections. This entails areas of bare earth and waterlogged conditions with scrub development. Most of the trees and shrubs are considered to be too young to support roosting bats but there some areas of dense ivy that is capable of supporting opportunistic bats during warm weather conditions scattered throughout the site. Given the immediate surrounding areas (see section 3.3.4) this area is likely to offer good foraging along the linear features (*i.e.* woodland edges), within the canopy and around the standing water areas.

Eastern Field

The semi- improved grassland has a relatively short sward with plentiful dung from rabbits and some grass tussocks. There are minor linear features in the form of wire fences and scant shrubs on the boundaries along with the secondary woodland boarding the western and southern fringes. No doubt the field will support foraging bats over a wider part of their general foraging.

Transect Locations

For the purposes of the bat transect, the transect locations are described below:

Locations A-B – this section includes an area of partially used paths through the northern edge of the woodland leading to the eastern field with tree and scrub development and abuts the active commercial units along the industrial area. Approximately 100m long.

Locations B-C- D – this commences from the north-eastern edge of the woodland and follows the edge of the eastern field around the northern and eastern boundaries. Approximately 140m long.

Locations D-E- F – this includes the southern and western boundaries of the field that run along the border of the woodland. Approximately 150m long.

Locations G-H- I – this includes the intersection of the two parts of the pond and scrub and tall tree edges within the woodland. It traverses the Red Brook area. Approximately 210m long.

Locations J-K– this includes the southern boundary of the site and includes a line of tall trees within the woodland and an exposed bank of improved grassland. Approximately 250m long.

Locations K-G – this includes the burial grounds and skirts around the wester end of the pond. Approximately 90m long.

Locations G-A – a partially worn path leading from the pond area to security fence on the northern boundary. Approximately 80m long.

Please refer to Map 4 in Appendix 1 for transect locations and Appendix 2 for site photographs.

3.3.1 Building Assessment

External and Internal Assessment

The small open sided brick pillbox with flat concrete roof c.2m high and adjoining brick walls occurs towards the south-western corner of the meadow adjoining the woodland. The pillbox is overgrown with dominant ivy and overhanging trees from the woodland. No evidence of bats (droppings or feeding sign) was found and given that it is open to the elements, it is considered to be of negligible to poor habitat for roosting bats. It may, on occasion, be used as a night perch.

3.3.2 Wider Site Assessment

The Site is located in a mixed landscape that includes commercial and industrial units of Rotherwas, sewage works, broadleaf and conifer woodlands, river valleys, arable and pasture, interconnecting hedgerows and mixed aged buildings located in a number of village settlements as well as Hereford city. The site itself borders a small number of habitat features which are considered to provide minor foraging opportunities for bats in the form of the network of established commercial units, the River Wye, small wooded copses, pasture and scrub development. By reviewing Google Earth, the Ordnance Survey Outdoor Leisure 189 map (Hereford & Ross-on-Wye) and magic.gov.uk website, a description of the surrounding habitat within a 5km radius can be made. Please refer to Appendix 1 (Maps 1, 6 and 7) along with Appendix 2 for offsite photographs references.

By taking into consideration the southern and eastern fringe of Hereford city districts (Rotherwas, Lower Bullingham, Bartonsham, Putley, Blackmarstone and Hampton Park – all former villages before the city expansion) and other local village and hamlet settlements, namely, Hampton Bishop, Franchise Stone, Dinedor, Bullinghope, Holme Lacy, Mordiford and Bolstone, the wider landscape around the site is fairly-well wooded (with the exception of the Hereford boundaries), including numerous areas of linear trees, scant patches of wood pasture, small woodland copses, wood pasture and larger woodlands. Those woodland areas within 5km of the site include ancient semi-natural woodland, ancient replanted woodland and conifer plantations. Examples include Rotherwas Park Wood, Rough Hill, Dinedor Camp, Nether Wood, Reece's Wood, Ramsden Coppice, Widow's Wood, Apostle's Wood, Brick Kiln Wood, Newtown Grove and Rough Hill Wood. This range of woodland age structures and features provide suitable foraging and roosting grounds for a wide range of bat species.

In addition, directly east of the site includes the Woolhope Dome complex of woodlands which are largely formed on a calcareous band of Silurian aged rocks that offers the area a high degree of biodiversity. The Woolhope Dome woodlands offer a range of habitats, including quarries, limestone grasslands, unimproved pasture, common land, mixed woodlands, standing water and orchards. Nearby woodlands include Fownhope Park, Nupend Wood, Cherry Hill Wood, Nover Wood, West Wood and Haugh Wood.

The same area of settlements includes a range of mixed aged buildings including medieval, 16th to early 20th century. Due to the changes of the Rotherwas area since the 1920s, many of the buildings (mostly commercial) around the site date from the 1940s to the early 21st Century and as such offer very little opportunity for roosting bats. However, Rotherwas Chapel is likely to support bats and one of the records appears to represent that site. The nearby sewage works is likely to attract numerous detritus-associated insects, which will consequently entice bats.

The buildings in the wider area are likely to support a range of multiple bat roosts. Once again, this range of features will no doubt support a variety of local bats in terms of roosting. It has been noted that this section of the Wye Valley is known to support lesser horseshoe bats in a range of buildings, noted around Holme Lacy, Fownhope, and Mordiford (authors personal knowledge). For example, Holme Lacy House (hotel) and surrounding farms are known to support maternity and hibernation sites for this species, with large numbers found (some sites have 500+ bats). In addition, through transect surveys undertaken in the area, it is also known that lesser horseshoe bats are known to broadly forage in a variety of habitats and include wooded areas and the riparian habitats around the River Wye. Lesser horseshoe bats are reliant on linear habitat features such as bushy hedgerows and mixed structure woodland, and have an association with waterways.

The lesser horseshoe bat has been the subject of widespread conservation activities in Europe. Much of this effort has concentrated on roosts in buildings and caves. As no suitable buildings or other roost features will be affected by the proposed works, then no further comment is deemed necessary. In recent years, attention has turned to identifying more precisely the food and foraging requirements (Knight 2006, Knight & Jones 2009, Reiter *et al.* 2009, Reiter *et al*. 2013 and Schofield 2008). The implications of these studies, among others, is that it is crucial to maintain and enhance foraging near roosts and to safeguard the diversity of foraging features, so that a greater diversity of insect prey is available.

Investigated factors affecting recovery in British lesser horseshoe bats found that their results indicated that colony size was positively related to a range of landscape features (*e.g*. amount of

broadleaf woodland and grassland and the density of linear features) surrounding the roost, while the amount of artificial light at night had a significant negative effect. They recommended that the conservation of photophobic bat species such as lesser horseshoe bats should focus on both the improvement of foraging/commuting habitats and the creation of dark areas. Furthermore insect-rich feeding areas within 1km radius of a maternity roost are critically important in spring and summer for pregnant and lactating females, whilst non-breeding adults foraged over a wider area (approximately 4km).

Some recent conservation studies on lesser horseshoe bats have focused on diet. Winter dietary studies (Williams *et al*. 2011) showed this species foraged regularly through the winter, mainly on dipteran flies in the families Tipulidae, Trichoceridae, Sphaeroceridae and Mycetophilidae. These dipteran families are associated with damp woodland and dead wood. Studies relating to habitat structure and diet (Bontadina *et al*. 2008) have suggested that even though some habitats are broadly present, there may be cryptic habitat deterioration due to multiple factors which leads to a decrease in the ecological quality of a habitat, although its area and structure may remain unchanged and thus results in poor quality foraging opportunities. This leads back to the established theme of connectivity to varied habitats, especially in the spatial and temporal habitat features, which in turn offer different prey sources. These factors are largely absent from the Site.

The wider area includes improved grassland and poor to moderate species rich semi-improved grassland along with unimproved areas in the Woolhope Dome, which range from acidic to calcareous conditions but neutral grassland dominate, especially along the River Wye. Much of the pasture is grazed by sheep and cattle. The surrounding grasslands also include some examples of good quality semi-improved grassland. Due to the local river networks, there are patches of floodplain grazing marsh around the River Wye. There are also areas of arable but these are less significant for foraging bats.

The local river network and its associated riparian habitats, provides very suitable foraging grounds for a range of bat species. The most notable features in the area include the River Wye along with Withy Brook, Twyford Brook and the on-site Red Brook. In addition, the River Frome confluence with the River Lugg at Hampton Bishop, which in turns joins the River Wye at Mordiford. These waterways offer very good foraging conditions for local bats and the River Wye and River Lugg are both locally noted as important landscape features.

Based on the range of habitats within 5 km radius of the site and the 2km records from the commissioned data search, the local features provide moderate to good foraging habitats for at least eight species of bat recorded and most notably lesser horseshoe bats.

3.4 Bat Activity Transect Survey

Location of transects and transect codes are detailed in Map 4. Generalized flight patterns are shown in Map 5. The following tables are heavily edited for clarity and succinct representation of the data. Figure 3 illustrates the activity per transection section.

Table 3.4 (a) Transect Activity Survey One – 20th August 2017 Sunset: 20:16

Factor	Start of survey	End of survey
Time	20:15	23:00
Temperature °C	16.6	13.2
Wind speed	2mph	3mph
Wind direction	W	WSW
Cloud cover (%)	80	80
Humidity	72	80
Precipitation	-	-
General	A humid, warm and dry evening.	

Activity		Details			
Start	**Details**	**Species**	**No**	**Location**	**Behaviour**
20:25 - 22:42	Foraging	*Pipistrellus pipistrellus*	3-4	A-D	Foraging along this section, with most activity in the wooded section. Seen and heard echolocating at 45kHz.
20:26 – 22:48	Foraging	*P. pipistrellus*	2-4	G-H	Foraging around the ponds and the associated wooded areas. Heard echolocating at 45kHz.
20:28 - 21:59	Commuting /foraging	*Nyctalus noctula*	1	Over site	Foraging over site. Seen and heard at 19 kHz.
21:09 - 21:34	Foraging	*P. pipistrellus*	1	I-K	Brief foraging. Heard echolocating at 45kHz.
20:32 - 22:30	Foraging	*P. pygmaeus*	4	G-H & H-I	Foraging across the ponds. Seen and heard echolocating 55 kHz
21:14 - 21:43	Foraging	*P. pygmaeus*	1	B-E	Some brief foraging in the field area. Heard echolocating at 55kHz.
21:20 - 21:22	Foraging	*Plecotus auritus*	2	G-H	Foraging along the scrub area and around the ponds. Seen and heard echolocating at 40kHz.
21:24 - 22:40	Foraging	*Myotis sp.*	2-4?	G-I	Myotis activity along the vegetation of the ponds – either above or directly skimming. Seen and

					heard echolocating at 45-55kHz.
23.00	Survey ended				

Table 3.4 (b) Transect Activity Survey Two – 21st August 2017 Sunrise: 06:10

Factor	Start of survey	End of survey
Time	03:45	06:15
Temperature °C	11.3	10.0
Wind speed	4mph	2mph
Wind direction	S	SSE
Cloud cover (%)	85	100
Precipitation	-	-
General	A cool morning	

Activity		Details			
Start	**Details**	**Species**	**No**	**Location**	**Behaviour**
03:50 - 04:48	Foraging	*Myotis sp.*	3?	G-K	Foraging along this section, mostly around the water. Seen and heard echolocating at 45 -55kHz.
03:56 - 05:58	Foraging	*P. pipistrellus*	4-6	A -E & G-K	Foraging the eastern field and along the wooded area around the pond sections. Seen and heard echolocating at 45kHz. Notable feeding buzzes detected by the pond.
04:09 - 05:27	Foraging	*P. pygmaeus*	2-4 2	G-J	Foraging across the pond areas. Seen and heard echolocating 55 kHz.
04:28 - 04:31	Foraging	*Pl. auritus*	1-3?	G-H and J-E	Some brief foraging in the eastern area. Heard echolocating at 40kHz.
04:32 - 04:41	Foraging/ commuting	*N. noctula*	1-2	Over site	Foraging over site. heard echolocating at 19kHz.
04:34	Foraging	*Myotis sp.*	1	A-B	Myotis activity along the tall-herb near the engine house. Seen and heard echolocating at 45kHz.
04:35	Commuting	*N. noctula*	1	Over site	Heard at 19 kHz.
06:15	Survey ended				

Table 3.4(c) Transect Activity Survey Three – 16th September Sunset: 19:41

Factor	Start of survey	End of survey
Time	19:45	22:20
Temperature °C	13.0	12.4
Wind speed	4mph	1mph
Wind direction	W	W
Cloud cover (%)	55	20
Precipitation	None	None
Humidity (%)	70	98
General	Cool, dry evening with plentiful insect activity.	

Activity		Details			
Start	**Details**	**Species**	**No**	**Location**	**Behaviour**
19:59 - 22:07	Foraging & mating behaviour	*P. pipistrellus*	5-6	A-E & G-K	Foraging around the two main zones – eastern field and around the pond areas. Multiple Type D and some Type C social calls noted. Main calls heard echolocating at 45 kHz.
20:08 - 22:14	Foraging & mating behaviour	*P. pygmaeus*	4	G-H	Foraging along water areas with numerous social calls – Type D. Main calls heard echolocating at 55 kHz.
20:13 - 20:19	Foraging	*Eptesicus serotinus*	1	Over site	Heard and seen foraging in the open area and the tops of the trees. Seen and heard echolocating at 32 kHz.
20:24 - 21:31	Foraging	*Myotis sp.*	1	G-H & H-E	Foraging along ponds and through the tree canopy. Seen and heard echolocating at 45-55kHz.
20:25 - 21:03	Passes	*N. noctula*	1	Over site	Heard at 19kHz.
21:24 - 21:33	Foraging	*Pl. auritus*	11 6	G-K	Foraging. Heard echolocating at 40kHz.
22:20	Survey ended.				

Table 3.4(d) Transect Activity Survey Four – 03rd October 2017 Sunset: 18:45

Factor	Start of survey	End of survey
Time	18:48	21:20
Temperature °C	13.0	12.4
Wind speed	4mph	1mph
Wind direction	W	W
Cloud cover (%)	55	20
Precipitation	None	None
Humidity (%)	70	98
General	Cool, dry evening with plentiful insect activity.	

Activity		Details			
Start	**Details**	**Species**	**No**	**Location**	**Behaviour**
19:12 - 21:03	Foraging	*P. pipistrellus*	2-4	A-C & G-H and occ. J-K	Seen flying and foraging around near these areas. Heard echolocating at 45 kHz.
19:16 - 20:58	Foraging	*Myotis sp.*	1-4	G-H	Around ponds. Heard at 45 -58kHz.
19:31 - 19:48	Pass	*N. noctula*	1	Over site	Heard echolocating at 19 kHz.
19:32 - 19:37	Foraging & social activity	*P. pygmaeus*	3	G- H and B-D	Foraging and social behaviour in these areas. Heard echolocating at 55 kHz.
20:11 - 20:19	Foraging	*Pl. auritus*	1-2	G-H	Heard and seen foraging around the northern pond. Heard echolocating at 40 kHz.
21:20	Survey ended.				

Bat Transect Survey Summary

With the surveys complete, it was possible to analyse the bat transect data. Analysis reveals that there was a total of 467 bat passes, including 266 in the combined dusk-dawn August transect, 146 in the September transect and 55 in the October survey. Species noted were predominantly common pipistrelles and soprano pipistrelles along with brown long-eared, Myotid bats (Natterer's and Daubenton's bats). Noctule bats were noted over all the transects and serotine over one on the September transect – both species were noted over site.

During the activity transect surveys for the entire survey period, the most frequently used locations were the trees and shrubs of Locations G-H (around the two pond areas), along with moderate foraging levels across the eastern field. The southern section of the wood was low. From Figure 3, it can be ascertained most bat activity occurred G-H and A-B, namely the pond area and the northern boundary of the wood, activity was recorded throughout the site.

Table 3.4(e) Total number of bat passes during transects

Species	Date			
	20th August 2017	21st August 2017	16th September 2017	3rd October 2017
Common pipistrelle	32	46	43	28
Soprano pipistrelle	29	31	28	16
Brown long-eared bat	3	1	3	4
Myotis sp.	5	7	4	5
Daubenton's bat*	7	0	5	3
Lesser horseshoe bat	0	0	0	0
Noctule	3	2	2	3
Serotine	0	0	2	0

* = Daubenton's confirmed by flight behaviour (skimming water surface)

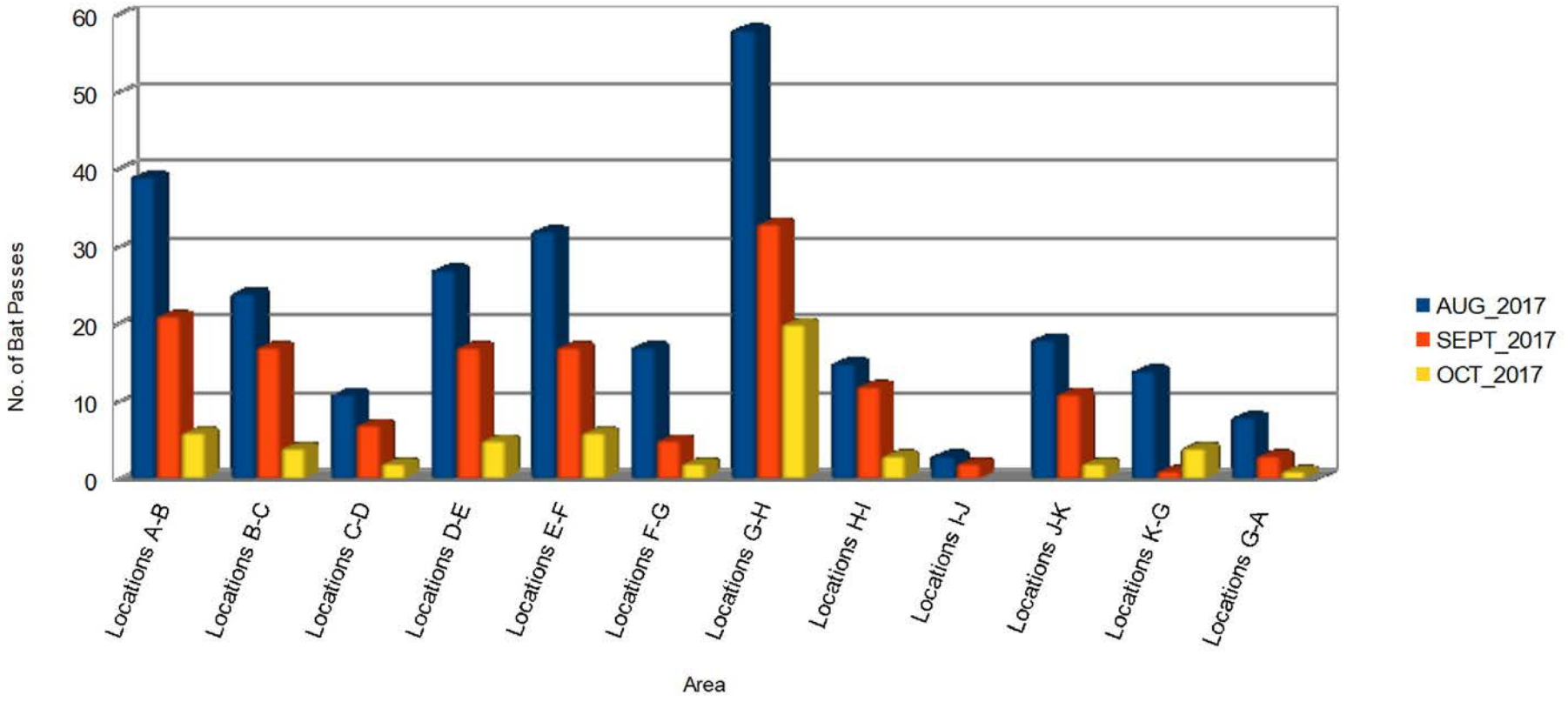
Static Detectors Results

The monitoring data from the static detectors was collated and summarized in Figures 4 to 7. The static detectors were position in the central section of the wood, either end of the ponds. Considerable activity occurred across the site where these detectors were placed. The species recorded were predominately common pipistrelles and soprano pipistrelles along with passes from brown long-eared bats, noctules, serotines, lesser horseshoe bats and myotid bats, most likely to be Natterer's bats (*Myotis nattererii*) based on the time expansion sonogram which was very short duration and extremely broadband and Daubenton's bats substantiated by the echolocation call on heterodyne (regular fast repetitive beats with a peak around 47-48 kHz). The main periods of activity typically occurred during the crepuscular light periods around post dusk and pre-dawn.

Table 3.4(f) Total number of bat registrations recorded via static bat detectors

Species	Date		
	20th- 24th August 2017	16th – 20th September 2017	3rd -7th October 2017
Common pipistrelle	138	154	64
Soprano pipistrelle	101	98	36
Brown long-eared bat	33	21	18
Unidentified Myotis sp.	38	26	10
Natterer's Bat	44	25	9
Daubenton's Bat	36	18	13
Lesser Horseshoe Bat	3	8	2
Noctule	13	11	5
Serotine	3	2	0

Figure 3: Number of bat passes per location over the four transects in 2017.



Please note the August data is a combined dusk-pre-dawn bat transect survey.

Figure 4: Overall summary of bat usage of the land of Chapel Road, Rotherwas over the three transects
The activity duration of bat activity between sunset and sunrise.

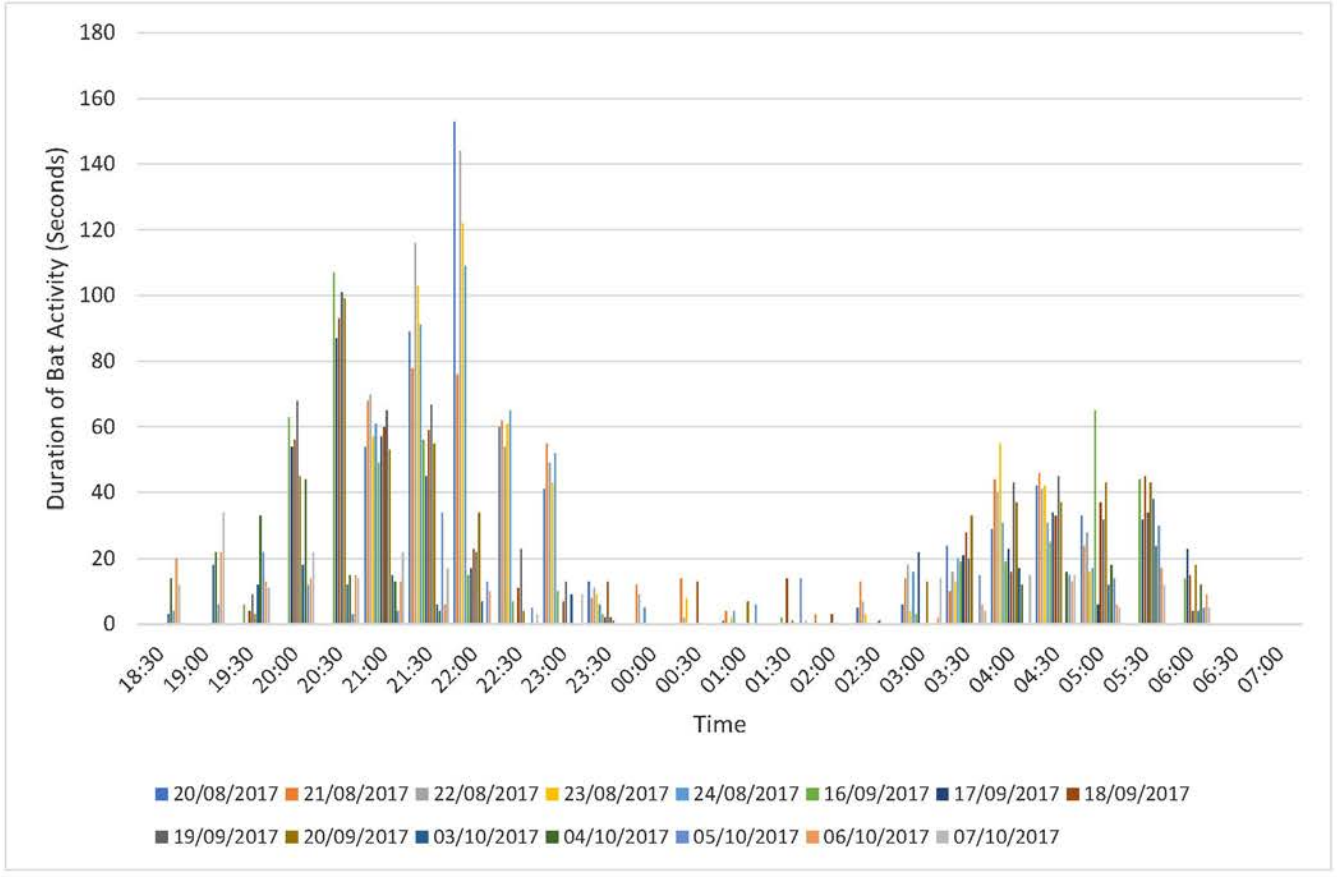


Figure 5: Summary of bat usage over the first transect

The duration of bat activity within the site between sunset and sunrise.

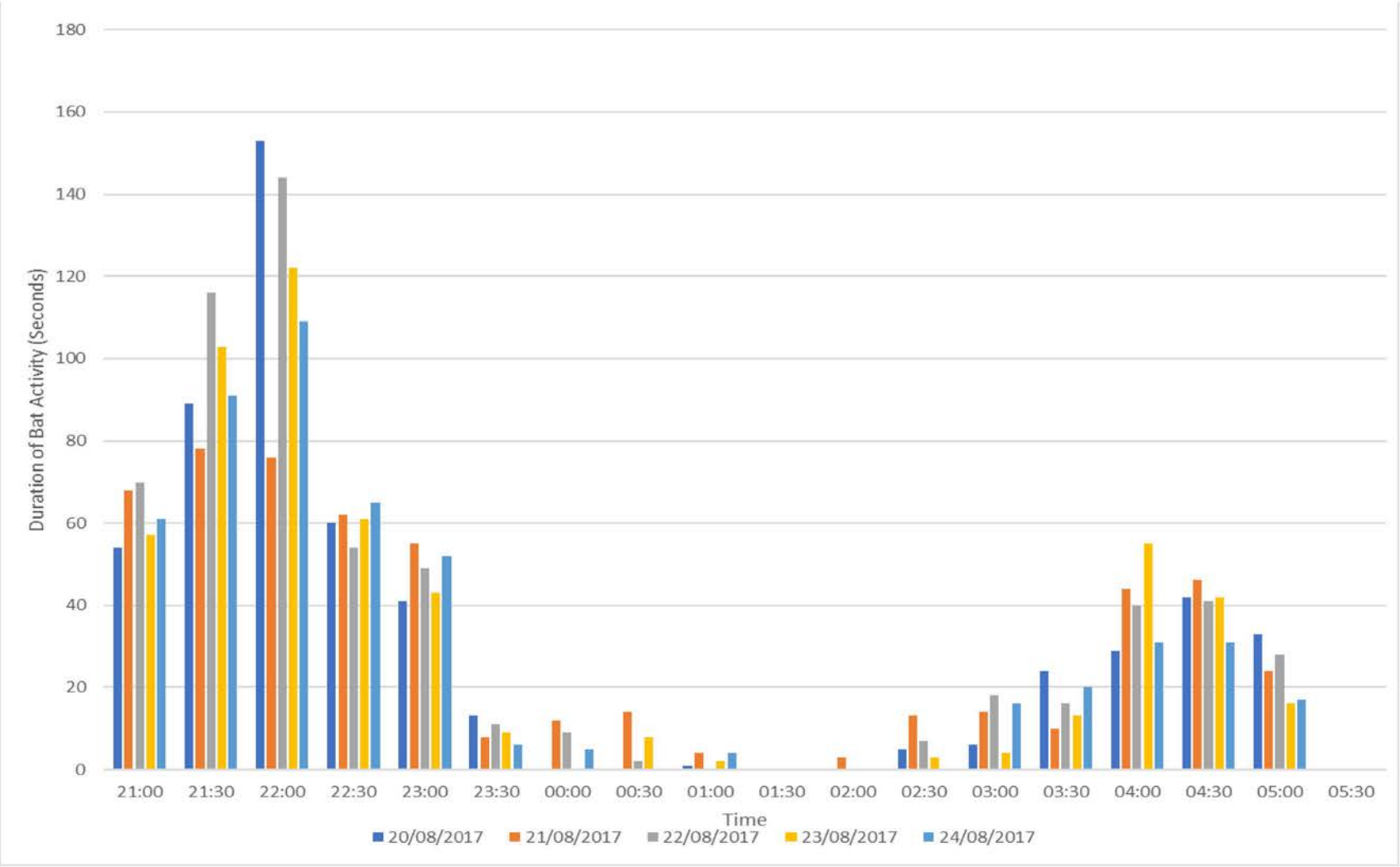


Figure 6: Summary of bat usage in the site over the second transect
The duration of bat activity within the site area between sunset and sunrise.

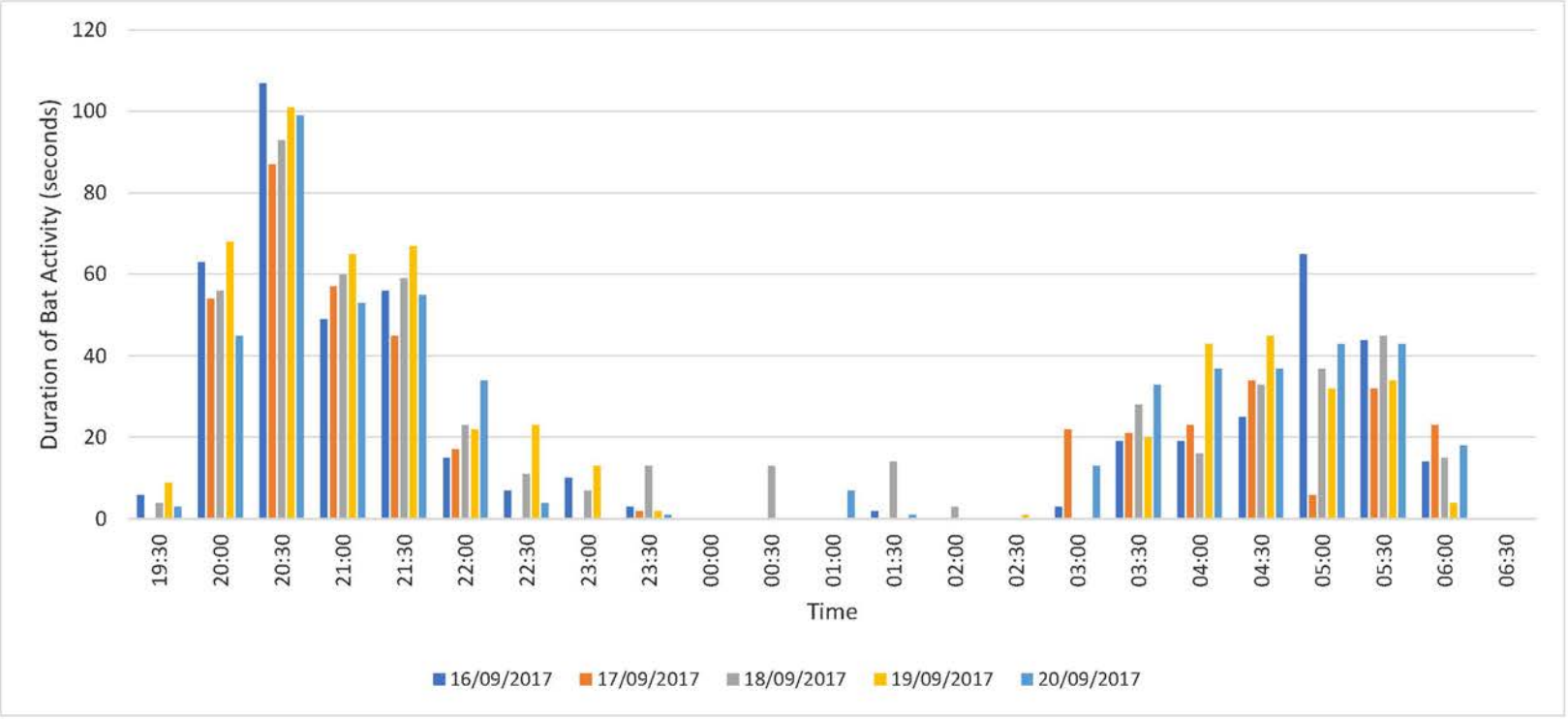
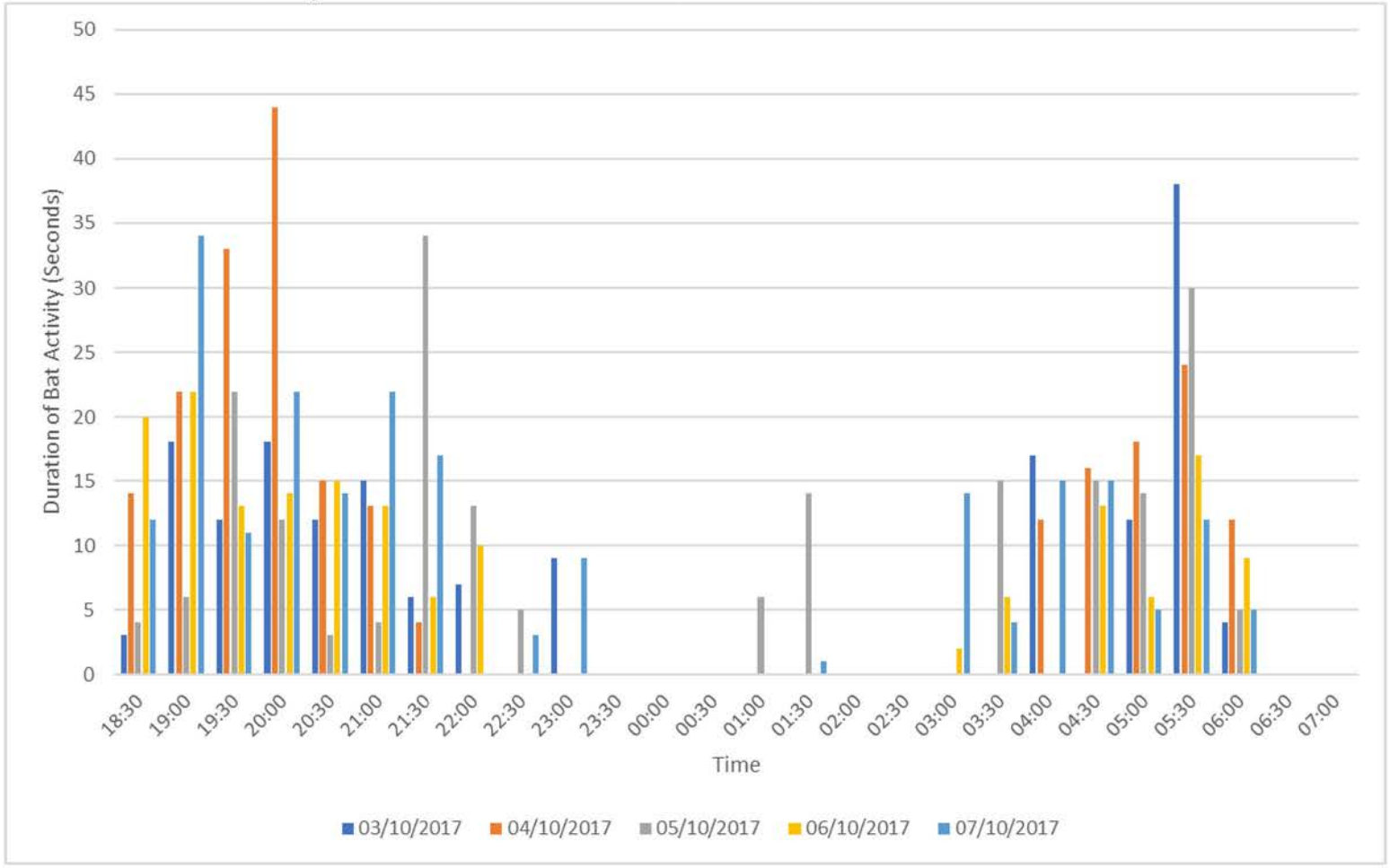


Figure 7: Summary of bat usage in the site over the third transect

The duration of bat activity within the site between sunset and sunrise.



4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Bat Results Discussion

The site was subject to four bat activity transect surveys and the 15 nights/early mornings of static recording over August to October 2017. Species noted were predominantly common pipistrelles and soprano pipistrelles along with brown long-eared, Myotid bats (Natterer's and Daubenton's bats), lesser horseshoe bats, noctules and serotines.

During the activity transect surveys for the entire survey period, the most frequently used locations were the trees and shrubs of Locations G-H (around the two pond areas), along with moderate foraging levels across the eastern field. The southern section of the wood was lower but, activity was recorded throughout the site. No bats were seen to emerge from on site features but it cannot be ruled out that the trees may support suitable roosting features, which were not visible from the ground inspection.

The following section interprets bat activity across the species as per each species found. It is based on both the transect survey data and the static remote sensors.

Common Pipistrelle Bats

Common pipistrelle bats were seen to forage across the entirety of the site, with the main areas noted along the woodland edges (western and southern sections) of the eastern field and through the open areas of the two pond areas. In addition, the northern path of the wood was also well used with other areas on site considerable less. Social calls were also noted, with advertisement calls at 20-30kHz (Type D) plus tandem flight calls at 60-90kHz (Type C) and observed flying.

Soprano Pipistrelle Bats

Soprano pipistrelle bats were also seen to forage across the entirety of the site, with the main areas noted along the woodland edges of the two pond areas. Elsewhere, on site, foraging was less. Social calls were also noted, with advertisement calls at 20-30kHz (Type D) plus tandem flight calls at 60-90kHz (Type C) and observed flying. The main focus of the mating behaviour was noted over the southern end of the pond, with prolonged periods of displays during the September transect survey.

Brown Long-eared Bats

Brown long-eared bats were seen to utilize the eastern end of the ponds. The bats were observed foraging almost on all site visits and were detected by the static detectors on all occasions. It should be noted that this bat species is particularly difficult to detect as they generally echolocate very quietly in the open and given that they tend emerge on average 33 minutes after sunset (Jones & Rydell 1994)

once light levels have sufficiently diminished, this species can be difficult to see emerging/returning. Therefore it is considered likely that foraging activity on the site for this species has been underestimated.

Myotid Bats

Some myotid bat activity was recorded on site and they mostly focussed on the pond areas. From the sonograms and flight behaviour, the two species definitely identified were Natterer's bats and Daubenton's bat. As recordings were not made for all encounters and some of the static recording was inconclusive, it is entirely possible that other species of *Myotis* could be on site. Of those recordings made either by the surveyors or the static recorders, the commuting calls of one species were of form and peak frequency to suggest most likely to be a Natterer's bat based on the time expansion sonogram which was very short duration and extremely broadband) and high flight patterns above the water. The other relatively confirmed species included Daubenton's bat which was substantiated by the echolocation call on heterodyne (regular fast repetitive beats with a peak around 47-48 kHz) and repetitive skimming across the water surface of the ponds.

Noctule & Serotine Bats

Noctule and Serotine bats were both observed to commute high above the site or close the upper canopy. However, it is possible that that during May/early June they could forage on site when large beetles such as cockchafers (*Melolontha melolontha*) are emerging. Serotines are a notable species using the site as they tend to have a southern bias in the English Channel counties with only a few further north towards the Midlands. As large bats and having an echolocation range that partially overlaps with that of Nyctalid bats, they are subject to being under-recorded but given that in 2010 this species was noted foraging in the area, then it would seem that the Rotherwas area offers suitability for this species.

Lesser Horseshoe Bats

This species was not recorded during the manned transect surveys but was recorded on all sessions of static recordings by both AnaBats on site, suggesting that they are foraging along the linear features of the divided pond area. Limited activity was recorded on site with only 13 registrations. However, it cannot be denied that the wider area and in particular, the surrounding woodland complexes will support lesser horseshoe bats, especially given the single record 300m south-east of the site. The wider area does offer moderate to good foraging and roosts are within the wider area (local knowledge of the author). Lesser horseshoe bats were expected to forage more frequently on site given the number of records in the 2km data search area and given the close proximity of a good habitat. One of the static detectors was placed low to the ground in the wood in case any foraging would occur lower to the ground, as is sometimes typical for this species. Hunting grounds for this species are usually within 2.5 km radius around a maternity roost and 4km for non-breeding summer roosts (Bontadina et al. 2002). They normally follow linear structures, such

as hedges, ditches, river edges and woodland edges and can cross open countryside including pasture and arable (Reiter *et al*. 2013; Schofield 2008 and Zahn *et al*.2008). With only 13 registrations and none recorded during the manned transect surveys, the site therefore would appear to currently offer low grade favourable conditions for foraging or at least prolonged foraging. The transects lasted 2.5 hours after sunset, which should have detected at least some more activity given that there is suitable habitat nearby. Emergence times for this species tend to be on average 33 minutes post sunset, with the later summer months animals tending to emerge later but still within the hour (Jones & Rydell 1994; Knight 2006 and Reiter *et al*. 2008).

The key issues with the site regarding lesser horseshoe bats, as well as other bat species, is that the site lacks suitable roosting features and is located in a relatively industrialised landscape, and as such is quite remote from more favourable roosting sites. However, the amount of bat activity in the area illustrates that the site is a favoured foraging feature, possible on the way to better site like the nearby River Wye (only 400m away). Given that activity was recorded in October, the site could possible used for winter foraging.

Winter activity in British lesser horseshoe bat populations has been studied by various researchers (for example, Crucititti & Cavalletti 2002; Robertson 2002; Williams *et al*. 2011). Arousal from torpor was based largely on the roost temperatures rising above 5^{o}C and at these temperatures some foraging was performed either in the hibernaculum (such as a cave or mine) or within the immediate vicinity. As lesser horseshoes are more prone to torpor related starvation due to their small body size than some other species of bat, they are generally more active near their hibernacula during the winter months. However, all the data implies that this is not cost effective as insects are scarce or absent. Other activities for bats arousing from winter hibernation include drinking, excretion, mating or sleep for both species. The site itself does not offer hibernating bats any suitability.

The possible implications for the site, especially given known hibernation sites in the Holme Lacy area and its surrounding habitat are that it is not likely to be used as a foraging ground in the winter. Furthermore, winter foraging is likely to be more successful within the woodland complexes that surrounds the site as woodlands are warmer than open fields.

Overall Impression

In view of the data and the habitats on site, it would appear that the site offers moderate to good foraging capacity, which taken into consideration the young age class of the secondary woodland and its remoteness in what is considered to be an industrialised landscape, is surprising. Given the range of species (*i.e*. at least 8) using an area that is approximately 3.4 hectares, the site clearly represents a significant foraging refuge – either on route to other areas or as main area for some species.

With regard to the possible proposed works, especially the development of the southern boundary of the site, there are some considerations to take account of prior to development. The site could form part of a core sustenance zone, as per Bat Conservation Trust (2016) for a number of species, despite no known roosts on site or immediately next to it. As a woodland and water habitat, there will be lighting considerations that will need to be carefully planned as to not deter bats from foraging on site.

4.2 Bat Conservation Measures

As lesser horseshoes are found in the local area and been recorded on site, it is imperative that the proposed site is maintained and enhanced where possible with the view to secure and enhance the favourable conservation status and resilience of the Wye Valley horseshoe bat populations. This should be done sympathetically towards maintaining flight ways and food sources. Management strategies should be based on sound scientific research and pragmatic solutions. Although no European Protected Species License is required at present, given the range of species found on site and especially lesser horseshoe bat, it is strongly recommended that a **dedicated biodiversity management plan** is created to ensure appropriate management of the site's ecological interest – namely the foraging bats. Given the results of the bat surveys, it would seem more crucial now to produce such a document in order to maintain and where possible enhance the habitat features so as to secure foraging and roosting bat features on the land off Chapel Road.

This plan must take account of the species using the site and special reference should be made for lesser horseshoe bats. This species is reliant on linear habitat features such as bushy hedgerows. Much research has gone into safeguarding day roosts as key factors in their conservation. Little emphasis regarding the need and conservation of night roosts has impaired some aspects of their conservation, as these may act as refuges close to foraging grounds. Recent research (Knight & Jones 2009) has shown that more than 75% of lesser horseshoe bats used night roosts away from the maternity roost, typically in buildings, with as many as 5 different night roosts being used by individual bats. Most night roosts were significantly nearer to core foraging areas than were maternity roosts and are considered to be an integral part of core foraging areas.

Other studies have focused on diet. Winter dietary studies (Williams *et al*. 2011) showed this species foraged regularly through the winter, mainly on dipteran flies in the families *Tipulidae, Trichoceridae, Sphaeroceridae* and *Mycetophilidae*. These dipteran families are associated with damp woodland and dead wood. Studies relating to habitat structure and diet (Bontadina *et al*. 2008) have suggested that even though some habitats are broadly present, there may cryptic habitat deterioration due to multiple factors which leads to a decrease in the ecological quality of a habitat, although its area and structure may remain unchanged and thus results in poor quality foraging opportunities. This leads back to the traditional theme of connectivity to varied habitats, especially in the spatial and temporal habitat features, which in turn offer different prey sources.

It may also be relevant to supplement a night perch site, either by modifying the on-site building or by creating a new one, especially for lesser horseshoe bats. The details would be provided within a suitable produced management plan but this cannot be created until any development plans have been confirmed.

On Site Lighting

The **impact of lighting upon bat foraging habitat, namely the woodland features (including the pond), should be minimised**. This especially significant for foraging bats, most particular lesser horseshoe bats. Once the proposed lighting scheme has been proposed, the plan should be reviewed by a suitable qualified ecologist to ensure that the lighting plan will not affect the foraging bats. Lighting within 20m of these boundaries should only be used where necessary and should be directionally targeted away from the boundaries in order to avoid light spillage onto the boundary vegetation and the water-bodies. This may be achieved by fitting lights with suitable internal reflectors and external shields to avoid illuminating the boundaries. Low pressure sodium lamps or even high pressure sodium lamps have a lower impact when compared with mercury or metal halide lamps and therefore they should be used where possible. It is strongly recommended that any lighting to be incorporated in the site should be low-powered, downward-pointing and/or mounted at a low level (e.g. standard bollard height) to minimise the level of impact from lighting on bats.

Bat Boxes

Roosting opportunities for local bats must be incorporated into the new buildings (should they be created) through the installation of bat boxes/tubes in the proposed development zone. Any retained suitable trees will also be enhanced with bat boxes. Once a precise plan has been produced, then locations for bat features can be confirmed.

Although the number of buildings on site is not known, it is recommended at least that 5 bat boxes are installed on any new buildings. These bat boxes are to be either on the exterior walls of the properties (*e.g.* Schwegler 1WQ/1FF bat box) or internally incorporated bat tubes. Additional bat boxes are to be installed on suitable trees (e.g. Schwegler 2FN on medium- large trees), numbering no less than 12. Bat boxes should be installed at minimum heights of 2.5m, facing away from external illumination and should ideally face in a south-east or south-west orientation. Examples are provided in the Ecological Enhancements Appendix below.

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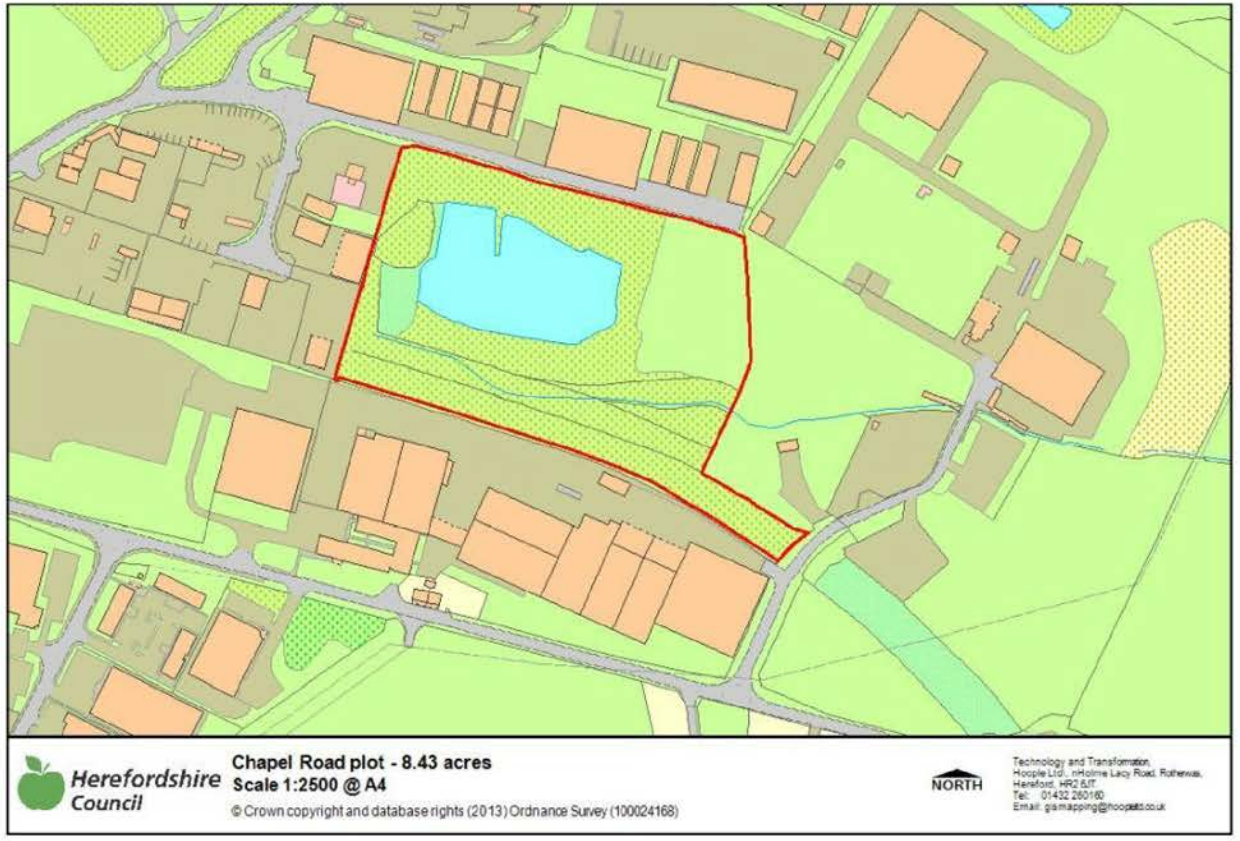
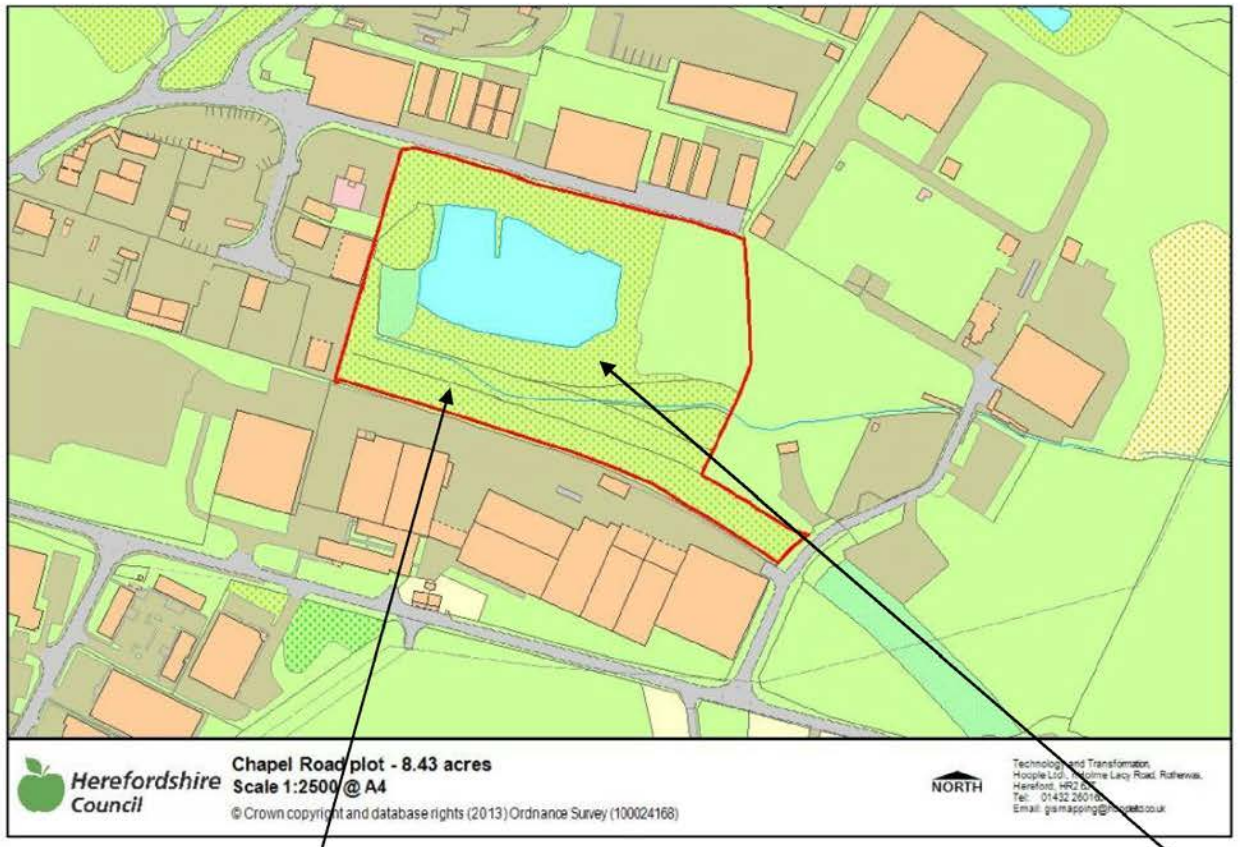
Appendix 1. Site Maps

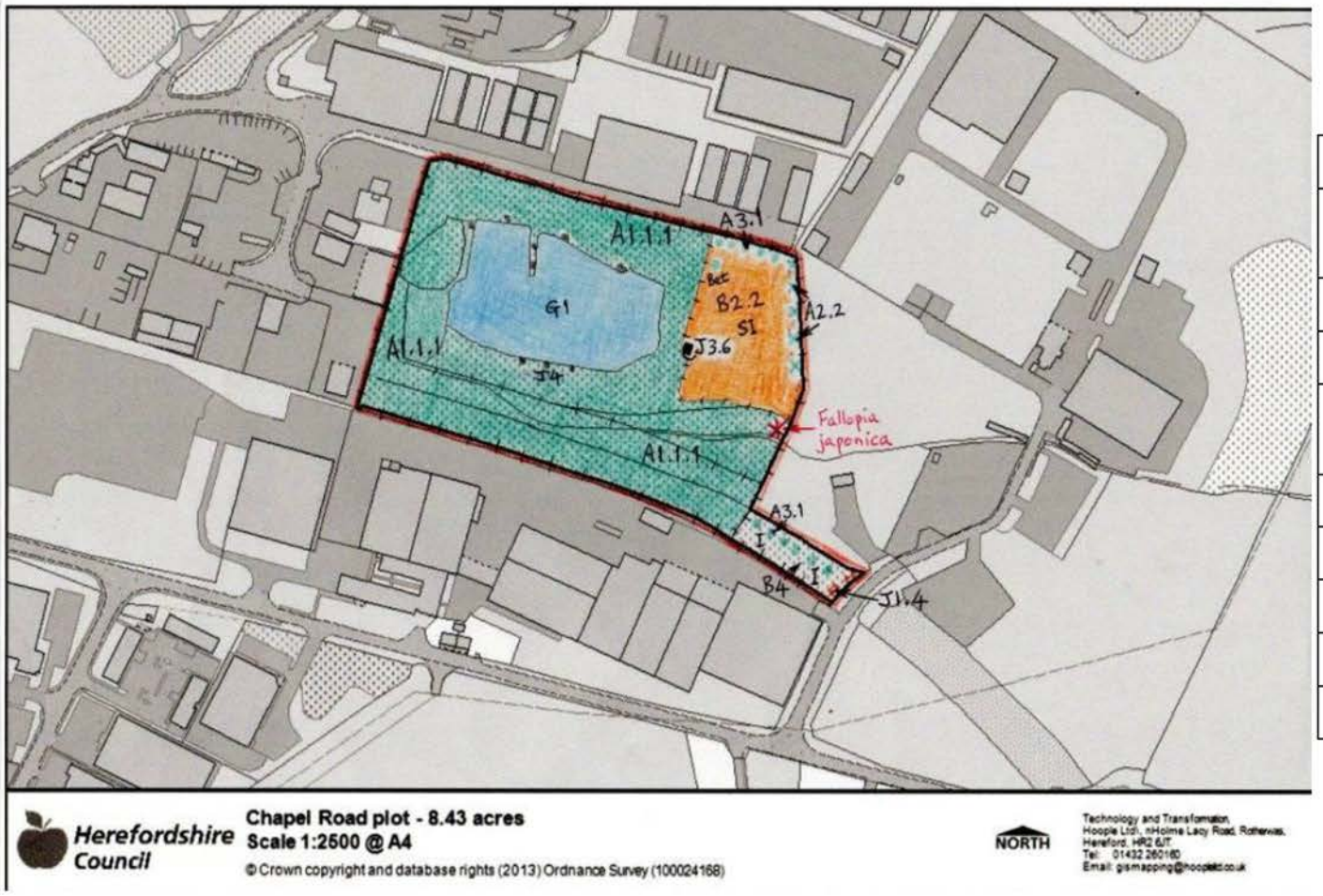
Map 1: Possible Site Proposal Area



Map 2: Possible Site Proposal

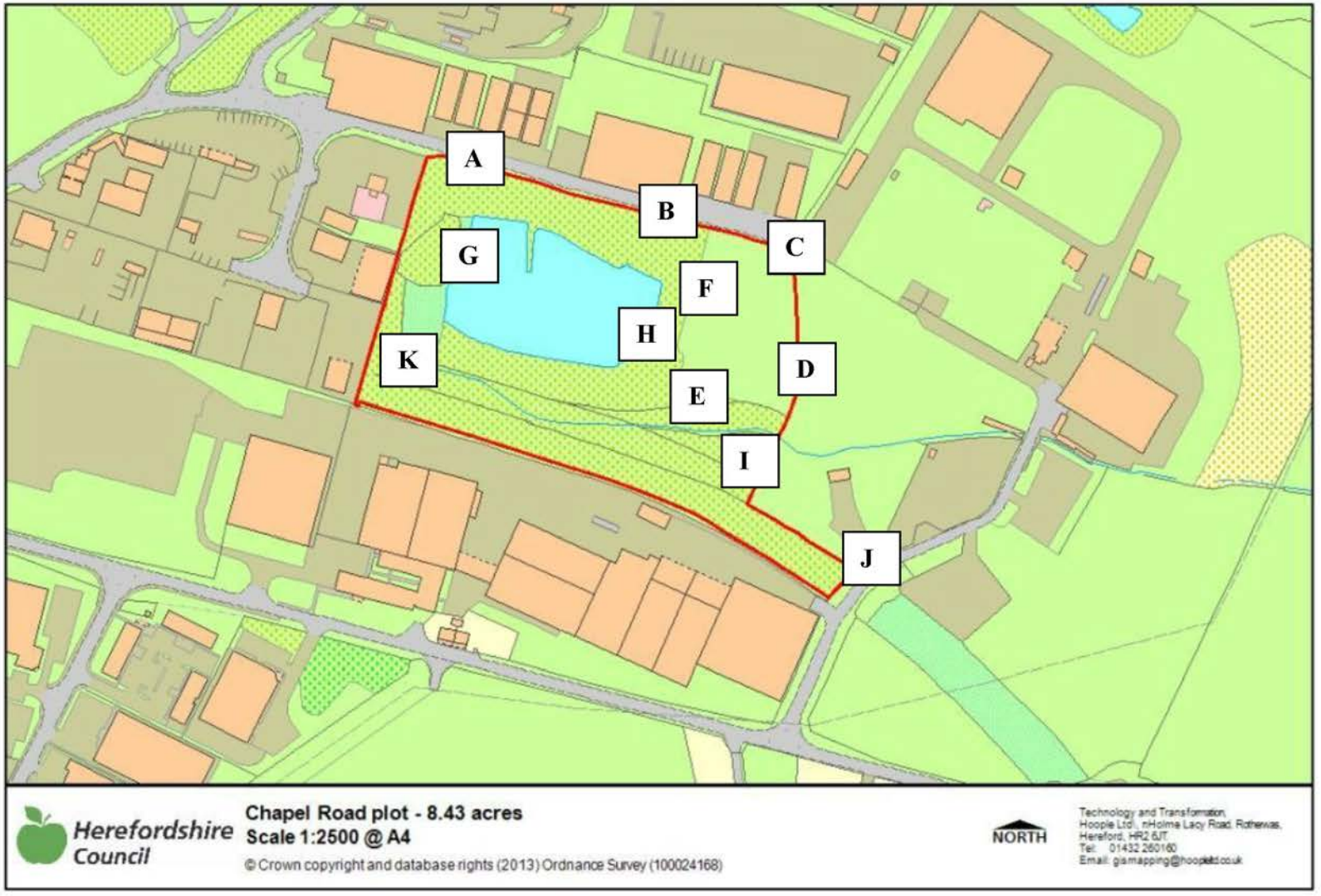


Map 3: Phase 1 map

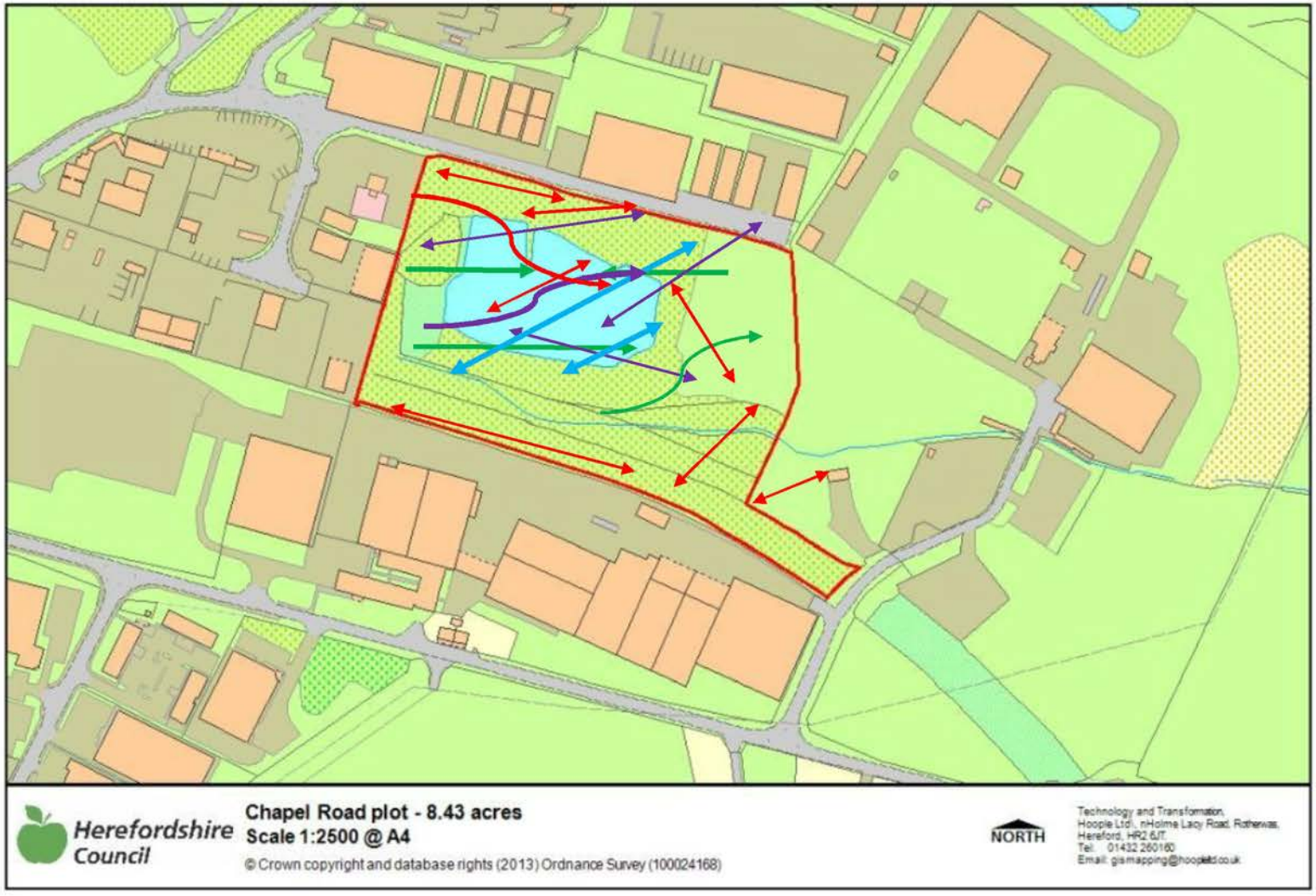


Legend
A1.1.1 Semi-natural broad-leaved woodland
A2.2 Scattered scrub
A3.1 Scattered broad-leaved trees
B2.2 Semi-improved neutral grassland
B4 Improved grassland
G1 Standing water
J1.4 Introduced shrub
J3.6 Building
J4 Bare ground

Map 4: Bat Transect Locations



Map 5: Bat Activity Locations (Generalized)



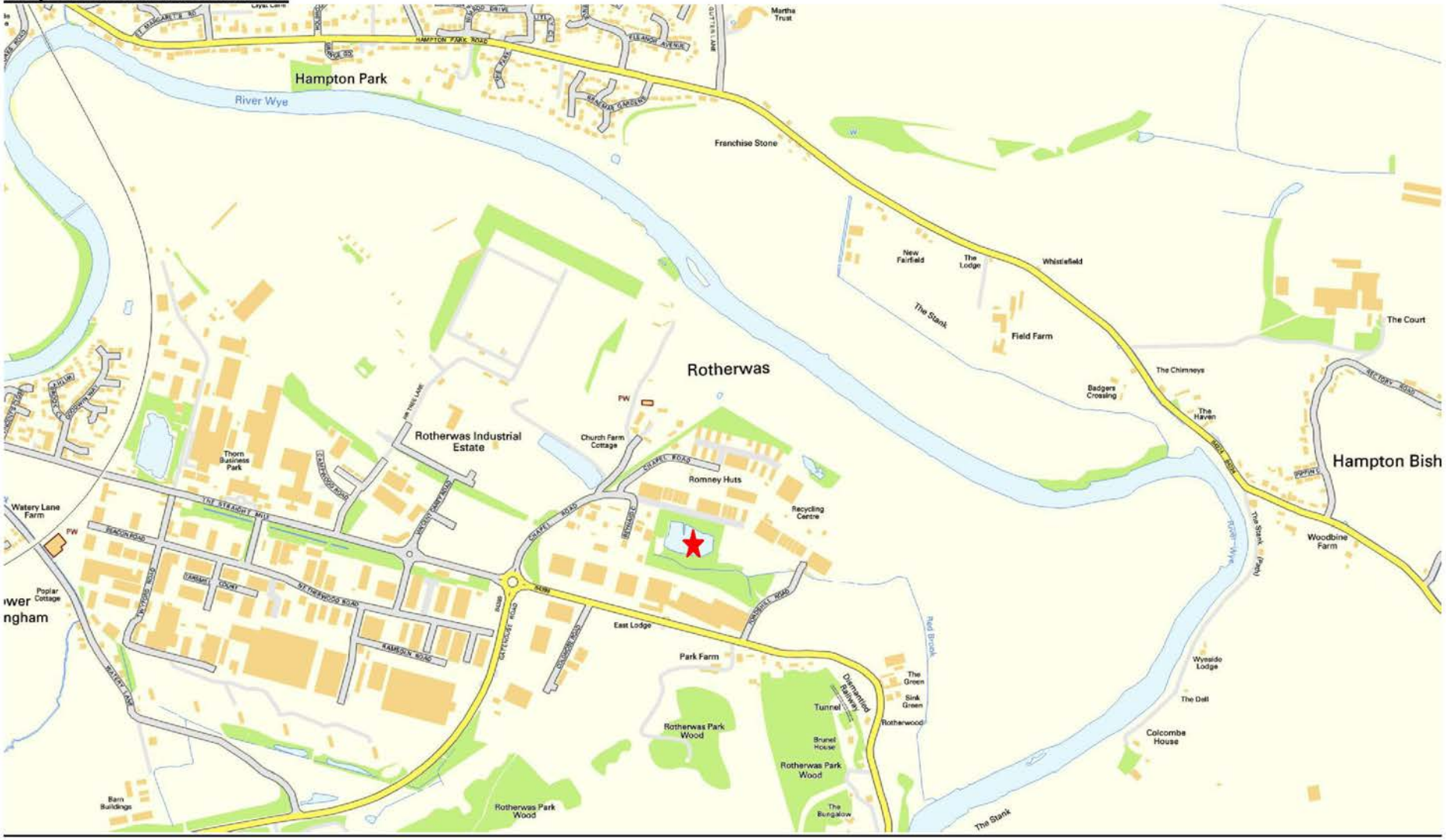
Key	
	Common pipistrelles
	Soprano pipistrelles
	Myotid bats *
	Brown long-eared bats

* = Inclusive of both identified Natterer's bats and Daubenton's bats.

NB – Species in table included those foraging within the field area and canopy of secondary woodland. Two species were noted flying over the canopy including both noctule and serotine bats.

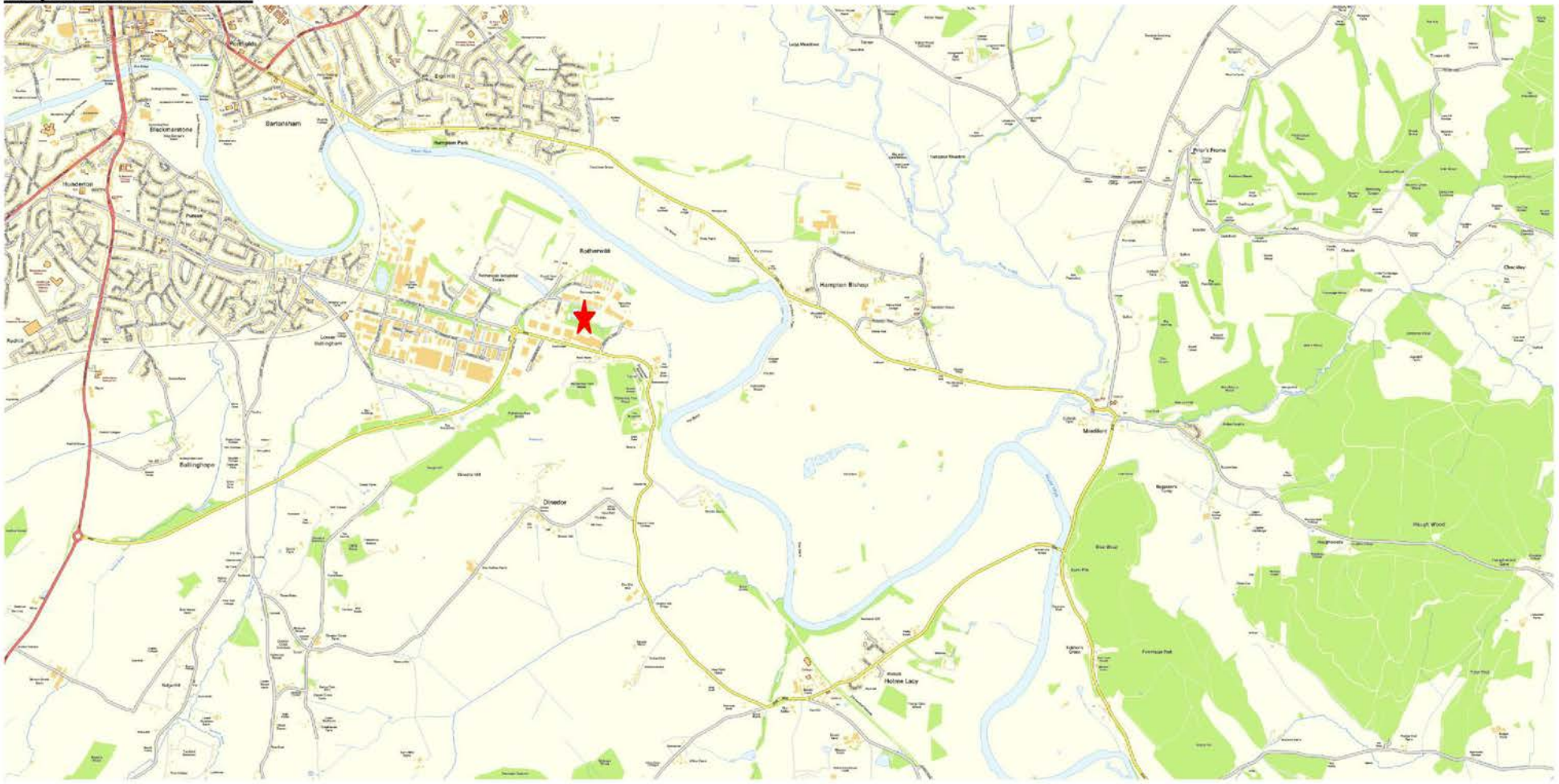
Lesser horseshoe bats were recorded via static detectors and assumed to be within the canopy due their form of echolocation. However, none were recorded during the actual manned transect surveys and it should be noted that static recordings of this species did not correspond with the manned survey sessions.

Map 6: Immediate site area



Site marked by a red star. Contains Ordnance Survey data (c) Crown copyright and database right 2017

Map 7: The Wider Area



Site marked by a red star. Contains Ordnance Survey data (c) Crown copyright and database right 2017

Appendix 2: Site Photographs

A) Site Photographs

Plate 1: The northern pond

Plate 2: The southern pond

Plate 3: Part of the dry shore of the southern pond with some scrub development – note this was one of the richest areas for foraging bats (transect H-I) .

Plate 4: Rough-trod path between the two ponds (transect G- H)

Plate 5: Area near the burial ground on the western end of the site (transect G-A).

Plate 6: The path on the northern end leading to the eastern field (transect A-B)

Plate 7: Transect I-J near the Red Brook

Plate 8: Transect K area

Plate 9: Transect J area

Plate 10: The raised bank area between the two ponds

Plate 11: Transect B-C area leading from the wood into the eastern field

Plate 12: Transect C-D area of the eastern field

Plate 13: Transect D-E area

Plate 14: Eastern field area facing part of the eastern industrial

Plate 15: Transect area J out of site to the east

Plate 16: Transect area J facing into site – note the car area is off site

Plate 17: The western boundary of the site from Reynard Close

Plate 18- Northern boundary of the site.

Plates 19 and 20 – the on-site building

B) Wider Site Photographs

Plate 21: Industrial units (Nissen huts) just north of the site

Plate 22: Rotherwas Park Wood background, Fordshill Road foreground

Plate 23: Storage yard with the eastern field hidden the background

Plate 24: Remnant of the industrial past as munitions factory and the railway

Plate 25: Industrial units east of the site

Plate 26: Linear tree lines leading from the industrial estate to the east

Plate 27: Dinedor Camp

Plate 28: Rotherwas Chapel

Plate 29: The River Wye from Holme Lacy Bridge and West Woods in the background.

Plate 30: Flood plain of the River Wye – arable and pasture

Plate 31: The Wye Valley facing southwards

Plate 32: Reynard Close leading into Chapel Road

Plate 33: Holme Lacy House (Hotel) noted for lesser horseshoe bats

Plate 34: Holme Lacy Parkland

Appendix 3: Wildlife Legislation

Horseshoe Bats

As both greater horseshoe and lesser horseshoe bats are IUCN Red Listed species (as Least Concern), along with numerous other wildlife designations, there are both of international significance and as such there should be some efforts to enhance the site for the conservation of these species. Both are protected by national legislation. There are international legal obligations for its protection through the Bonn Convention (Eurobats) and Bern Convention in parts of its range where these apply. There are included in Annex II (and IV) of the European Union Habitats Directive, and hence requires special measures for conservation including designation of Special Areas for Conservation. There is some habitat protection through Natura 2000 (some roosts are already protected by national legislation).
Britain has two species of horseshoe bats:- the greater horseshoe (*Rhinolophus ferrumequinum*) and the lesser horseshoe (*R. hipposideros*). These are members of *Rhinolophidae* bats, with a total of five species in Europe.

The greater horseshoe is the largest European horseshoe bat with a wingspan of 330-400 mm. As with other *Rhinolophidae* bats, it has a complex nose structure which resembles a horseshoe, which contributes towards its highly specialized echolocation system. Its range extends from north-west Africa, the Mediterranean area and central Europe to the Far East. In Britain, it is found in South Wales and South West England extending up to Herefordshire. The species has suffered a catastrophic decline over the last 50 years, with it becoming extinct in parts of its former range. The reasons for the decline are thought to be the use of highly toxic pesticides in agriculture and forestry which have significantly reduced its food source, timber preservatives, habitat fragmentation and alteration or loss of roost sites, among other factors. Typical habitats for foraging include woodlands, riparian areas and pastures, especially cattle-grazed. Roost selection tends be old buildings (especially attics), mines, caves and tunnels for all forms of activity habitats. Greater horseshoe bats tend to be sedentary and the roost ranges from 20-50 km, with British ranges tendering to be less (Hutter *et al*. 2005). As an insectivorous species they feed on beetles, moths and other insects it catches using aerial hawking and fly-catching techniques.

The lesser horseshoe bat is the smallest European horseshoe bat with a wingspan of 190-254 mm. Distributed across most of Europe, it can be found in warmer regions with woodlands, riparian forests and pastures. In Britain, it is found in central and south Wales, the Welsh Marches and South-West England. The selection of roosts depends on the temperature; large rock crevices and attics of buildings are chosen for summer, while caves, tunnels and mines are used during winter. Maternity colonies can reach 500 individuals but these hang individually and not in clusters. They are very agile, which allows them to quickly narrow the distance between them and their prey. While in flight, they are able to glean crane-flies, lacewings, moths and spiders from branches (Zahn et al. 2002). Similarly to other *Rhinolophidae*, the Lesser Horseshoe bat is rather sedentary and the average

distance between its roosts ranges from 5-50 km, with again British movements being less (Hutter *et al.* 2005).The lesser horseshoe bat faces threats such as the fragmentation and isolation of habitats, the disturbance and loss of underground habitats and the loss of attics (through loft conversions in human homes). Other threats include the effects of pesticides and agricultural intensification.

Bats in general

Bats often occupy different roost sites at varying times of the year; what is suitable as a summer roost may not be as suitable for hibernation due to the variation in temperatures, for instance. Females often occupy maternity roosts when giving birth and return to the communal roost when the young are partly grown. Individual bats may move their roost site dependent on weather conditions. Since bats tend to re-use the same roosts, legal opinion is that the roost is protected whether or not the bats are present at the time.

There has been a severe decline in bat numbers over recent years, the main factors currently causing loss or decline are probably related to the following:

- Intensification of agriculture and inappropriate riparian management.
- Widespread misunderstanding of, or possibly ignored, legislation protecting bats, leading to loss or damage of many roosts when consultation procedures have not been carried out.
- Loss, destruction and disturbance of other roosts, particularly maternity roosts, through the use of toxic timber treatment chemicals, intolerance by roost owners, inappropriate building practices and tree felling.
- Loss of winter roosting sites, which need to be cold, humid and undisturbed. Such sites may include buildings, hollow trees and underground sites (mines, old tunnels, icehouses and cellars).
- Losses, or changes to, large country properties which can supply both summer and winter roosts that are generally surrounded by potentially good foraging habitat.

All bat species are protected by law, both national (Schedule 2 of the Conservation of
Habitats and Species Regulations 2010 and Schedule 5 of the Wildlife and Countryside Act
1981 (as amended)) and international (The Bern Convention 1979, The EC Habitats Directive 1992 and The Bonn Convention 1980 including the Agreement on the Conservation of Bats in Europe, 1994). The Countryside and Rights of Way Act 2000 reinforces the Habitat Regulations by creating a criminal offence rather than a prohibited action (Schedule 12).

There are three main areas of protection:

- It is illegal to intentionally kill or injure a bat.
- It is illegal to disturb a bat roost. This covers all roost sites such as caves, trees and buildings.

- It is illegal to damage a roost site or obstruct the entrance.

Where developments requiring planning permission may affect protected species, such as bats, it is essential that appropriate surveys are conducted and submitted to meet the requirements of the National Planning Policy Framework. With regard to paragraph 117, in order to minimise impacts on biodiversity and geodiversity, planning policies should:

- *plan for biodiversity at a landscape-scale across local authority boundaries;*
- *promote the preservation, restoration and re-creation of priority habitats,*

ecological networks and the protection and recovery of priority species populations, linked to national and local targets, and identify suitable indicators for monitoring biodiversity in the plan;

If, following surveys, it has been established that bats are present and roosting within the structure to be affected by the proposed development then if there is a reasonable likelihood that a breech in the legislation will occur through undertaking the works a European Protected Species Licence for a development affecting bats will need to be obtained from
Natural England.

Under the Conservation of Habitats and Species Regulations 2010 licences can only be issued if Natural England are satisfied that:

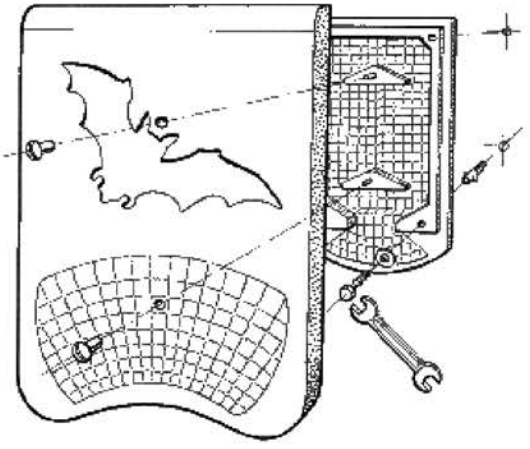
- there is no satisfactory alternative;
- the main purpose of the development is for either (1) 'Imperative Reasons *Overriding Public Interest'*, (2) "Public Health or Safety", or for (3) "Wildlife Conservation"*;*
- the action authorised will not be detrimental to the maintenance of the population of the species at a favourable conservation status in their natural range.

Undertaking work to a bat roost without following appropriate recommendations from
Natural England could lead to prosecution resulting in imprisonment, fines of up to £5000 per bat and confiscation of vehicles/equipment.

Appendix 4: Ecological Enhancements

BAT ROOSTING FEATURES

Schwegler 1FF bat box



Schwegler 1WQ Summer & Winter bat box

Ibstock Bat Brick – fitted into wall

Schwegler 2F box