

ECOLOGICAL APPRAISAL AND BAT SURVEY

UNION CHAIN BRIDGE



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UNLESS REQUESTED OTHERWISE, THE INFORMATION BELOW, RELATING TO THE LOCAL AREA, WILL BE PROVIDED TO THE LOCAL ENVIRONMENTAL RECORDS CENTRE					
SPECIES	RECORDER	DATE	LOCATION (4 FIG. NGR)	ABUNDANCE	COMMENT
Badger	E3 Ecology	August 2018	NT 93 50	-	Latrine
Soprano pipistrelle	E3 Ecology	August 2018	NT 93 50	-	Foraging
Nathusius' Pipistrelle	E3 Ecology	August 2018	NT 93 50	-	Foraging
Noctule	E3 Ecology	August 2018	NT 93 50	-	Foraging
Common Pipistrelle	E3 Ecology	August 2018	NT 93 50	-	Foraging
Myotis	E3 Ecology	August 2018	NT 93 50	-	Foraging

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A. SUMMARY

E3 Ecology Ltd was commissioned by Northumberland County Council in 2018 to undertake an Ecological Appraisal and bat survey of Union Chain Bridge, Berwick. Bat survey comprised a daytime bat risk assessment and both dusk and dawn bat activity surveys. Tree bat roost risk assessments with aerial access were undertaken of a number of trees around the bridge. Detailed surveys for badger, otter, invasive botanical species and red squirrel were also completed.

It is proposed to carry out structural refurbishment works to the bridge. This will require the establishment of temporary site compounds on each bank along with the clearance of a small area of trees and vegetation around existing mason towers to allow access of heavy machinery to the towers. A floating pontoon system will be utilised to dismantle the suspension bridge elements followed by refurbishment off site before being reassembled, also from the pontoon.

Consultation with the MAGIC website¹ indicated that the site is located within the River Tweed Special Area of Conservation (SAC), the Tweed Catchment Rivers (England) and River Tweed (Scotland), Site of Special Scientific Interest (SSSI). Without appropriate mitigation the proposals have the potential to negatively impact the habitats and species cited within these statutorily designated sites. As such an Appropriate Assessment and Habitat Regulations Assessment will be required and a report to inform this assessment has been produced separately.

An extended phase 1 habitat survey of the site was undertaken by Total Ecology in May 2017. Details of this survey can be found within the separate report: *Union Chain Bridge Extended Phase I Survey, Total Ecology, June 2017*.

Habitats within the survey area are dominated by the built structures of the bridge itself and the River Tweed. The left river bank (as looking downstream), Scottish, side of the bridge comprises a pasture field bordered by plantation conifer woodland. To the north of this section of the bridge comprises broadleaved woodland. The banks of the tweed comprises a mix of species poor semi-improved grassland and tall ruderal vegetation. The right river bank (as looking downstream) and English side of the bridge comprises a mix of broadleaved woodland and tall ruderal vegetation, whilst above the mason tower, which is set into the bank, is species poor semi-improved grassland. Himalayan Balsam and Japanese knotweed, both species listed as invasive on Schedule 9 of the Wildlife and Countryside Act 1981 were also recorded along the river banks. Giant hogweed and montbretia were also recorded by Total Ecology in 2017 but were not recorded by E3 Ecology Ltd in 2018.

The woodland within the survey area will provided nesting opportunities to breeding birds, as will the bridge structures, particularly within the mason towers. Riparian habitats will provide good quality habitat to a range of bird species and is part of a larger network of habitats of high ornithological value. Although no evidence was recorded during the survey work it is likely that the Schedule 1 species, kingfisher, will be present along the river and a pre-works check is recommended to ensure that there is no disturbance to this species as a result of works.

Badger survey recorded no setts within the survey area however one well used latrine was recorded within the woodland above the eastern mason tower. Snuffle holes and mammal trails, likely to be badger, were also recorded in a number of locations within the woodland and field to the east of the site, and within the conifer woodland to the west. The woodland riparian habitat surrounding the bridge will provide good quality foraging habitat for badger as well as potential

¹ MAGIC website: www.magic.gov.uk

sett creation opportunities. Survey results indicate that this species forages within the site on a regular basis with a sett located within the surrounding area.

Detailed survey of the river banks recorded no evidence of otter activity. Overhanging and woodland vegetation on the eastern side of the river will provide good potential opportunities for laying up areas or holt creation with vegetation providing good shelter and potential runs. The western river bank is more exposed and less likely to be used. It is highly likely that otter will forage within the river and commute through the survey area on occasion.

No squirrel dreys were recorded within any of the trees in the survey area during the initial walkover or the detailed survey in August 2018. Habitats within the site will provide good quality potential habitat to red squirrel.

The SAC and SSSI both list Atlantic salmon within their reasons for designation. Sea and river lamprey are also listed within the SSSI citation². Detailed survey was not undertaken for these species however given that these species are known to be present along the Tweed, will migrate through the site, with the additional potential for breeding use. Further survey is recommended in order to fully assess the potential impacts on these species.

Water vole are known to be present within small isolated populations along the River Tweed, as noted within the SSSI citation³. Habitats along river banks, in particular the right bank (when facing downstream), will provide suitable habitat for these species, although no field sign or burrows were noted during the watercourse survey.

Hedgehog and common toad, both national priority species, are likely to be present within the site. Habitats within the site will offer some limited suitable areas for reptiles. Other protected or otherwise notable species (excluding bats and birds) are considered unlikely to be present due to the lack of suitable habitats within the site or surrounding area.

The bridge structures comprise two mason towers of cut stone construction. The eastern, English tower, is set into the vertical bedrock, set back from the river, whilst the western, Scottish tower is free standing. The mortar and stone work appear in generally good condition but with a few noted gaps. Large square openings are present at the top of each tower which lead into, what appears to be, a small void into which the bridge suspension chains enter the tower. Some netting is evident within these openings, having previously been installed to deter nesting birds, however some has come away and evidence of continued use by nesting pigeons is clear. The top of the tower is flat with a small hatch. Internal access to the loft voids revealed large quantities of bird droppings and old nest remains. No evidence of bat use was recorded. Both towers are considered to be of moderate bat suitability.

The central bridge structure comprises overlapping timbers with tarmac overlaid. Areas that could be seen all appeared tightly sealed however the whole structure could not be inspected due to flowing water underneath. As such the bridge is considered to be of low suitability to roosting bats.

Four mature trees which are to be felled to allow construction machinery access, were also assessed further. Of these (T1+2) were climbed and assessed a low suitability for roosting bats. T3 +4 could not be fully inspected due the presence of a live overhead wire. No features were observed within the trees however given their size and age it is recommended that they are climbed prior to felling, once power has been disconnected, in order to check for any potential roosting features which have not been previously recorded.

² <https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/2000288.pdf>

³ <https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/2000288.pdf>

Dusk and dawn bat activity survey of the bridge structures recorded no evidence of roosting bats. Bat activity was dominated by soprano pipistrelles but with a small number of passes from common pipistrelle, noctule and Nathusius' pipistrelle. *Myotis* sp. foraging activity was also recorded around the woodland to the west of the Scottish tower. Overall habitats surrounding the site are considered to be of local value to bats but part of a network of habitats likely to be of much higher value.

There remains a low residual risk that the bridge is used by small numbers of bats, at intervals through the year. The tower structures are likely to be used, if at all, as an occasional summer non-breeding day roost site and perhaps a hibernation site.

Potential impacts of the proposed works include the following:

- Potential impacts on the SSSI and SAC and cited features within both designations.
- Loss of a small number of mature and semi-mature trees located around the mason towers.
- Risk of damage to roots and crowns of retained trees.
- Risk of pollution of the River Tweed from run-off or debris during restoration works.
- Temporary damage to improved and semi-improved grassland through use as site compounds during works.
- Risk of the spread of invasive species including Japanese knotweed, Himalayan balsam, giant hogweed, and montbretia during the works.
- Risk of disturbance to migratory or breeding salmon and lamprey.
- Temporary increased light spill during the restoration works.
- Low residual risk of causing harm or disturbance to bats.
- Loss of a small number of potential roost sites associated with the bridge through re-pointing works and exclusion measures for nesting birds.
- Risk of disturbance to foraging and commuting otter. Risk of disturbance to otter should a holt or resting place become established prior to the start of works.
- Disturbance to badger during works, risk of disturbance or damage to a badger sett should one be established prior to the start of works.
- Risk of harm to mammals through entrapment in works trenches, during the works.
- Harm or disturbance to red squirrel should a drey become established prior to the start of works.
- Harm and/or disturbance to nesting birds should any vegetation clearance be carried out during the breeding bird season (March to August inclusive).
- Low risk of harm and/or disturbance to water vole.
- Low risk of harm to reptiles.

Key mitigation measures will be finalised following the completion of further survey work, however will include:

- Additional external lighting that may reduce bat use of potential roost sites (retained and/or new) will be avoided. Light spillage onto adjacent habitats during the refurbishment work will be restricted.
- Vegetation clearance/tree felling will be undertaken outside of the bird nesting season (March to August inclusive) unless a checking survey by a suitably experienced ornithologist confirms the absence of active nests. A specific check for breeding kingfisher, a species listed on Schedule 1 of the Wildlife and Countryside Act (1981) will also be carried out pre-commencement of works should works commence during the breeding season.
- Prior to works commencing a site induction meeting will be held, attended by the project ecologist and lead contractors.

- Works will not commence until a detailed inspection of the structure has taken place once scaffolding/cherry picker access has been provided.
- Any excavations left open overnight will have a means of escape for mammals that may become trapped in the form of a ramp at least 300mm in width and angled no greater than 45°.
- The roots and crowns of retained trees will be protected throughout the development through the provision of adequate construction exclusion zones in accordance with the guidance given by BS5837:2012.
- Works onsite will follow detailed method statements relating to bats, otter, invasive species, cited fish species, and reptiles, as detailed within the Construction Environment Management Plan (CEMP) produced separately. This will be provided to contractors prior to the induction process at the start of works. The project ecologist will review all key points with contractors during the induction and provide all necessary training. An Ecological clerk of works will also be consulted during works and be present onsite as required.
- If bats are found during works, works will stop in that area and the ecological consultant will be contacted immediately. If it is necessary to move the bats for their safety, this will be undertaken by a licensed bat handler.
- Best practice methods will be followed to ensure that no contamination or pollution of the River Tweed occurs from works.
- Trees 3 and 4, will be inspected by aerial climbers prior to felling to ensure that no features unseen from the ground are present.

Pre-commencement checks for badger setts, red squirrel, otter and water vole will be undertaken one month prior to the start of works.

Mitigation strategy to address potential impacts on key fish species will be produced following further required survey work.

If you are assessing this report for a local planning authority and have any difficulties interpreting plans and figures from a scanned version of the report, E3 Ecology Ltd would be happy to email a PDF copy to you. Please contact us on 01434 230982.

B. INTRODUCTION

E3 Ecology Ltd was commissioned to undertake an Ecological Appraisal and Bat Survey of Union Chain Bridge, Berwick.

The purpose of this report is:

- To identify and describe all potentially significant ecological effects associated with the proposed development
- To set out the mitigation measures required to ensure compliance with nature conservation legislation and to address any potentially significant ecological effects
- To identify how mitigation measures will/could be secured
- To provide an assessment of the significance of any residual effects

The site is located west on Berwick-Upon-Tweed at an approximate central grid reference of NT 93301 50989. The site location is illustrated in the figure below.



FIGURE 1: SITE LOCATION

(OS mapping © Crown copyright and database rights 2016/2017 OS 0100039392)

It is proposed to carry out structural refurbishment works to the bridge.

Proposals will include the following:

- Establishment of temporary site compounds on each side of the bridge.
- Tree and vegetation clearance around existing mason towers to allow access of heavy machinery to the towers.
- Re-pointing of existing stone work.
- Sealing existing voids within mason towers in order to exclude nesting birds.
- Dismantling existing bridge structure using a Unifloat pontoon system⁴.
- Offsite repair and refurbishment to components of the bridge.
- Reassembly off the bridge using the Unifloat pontoon.

⁴ <https://www.jenkinsmarine.co.uk/unifloat-pontoons.html>

C. PLANNING POLICY AND LEGISLATIVE CONTEXT

C.1 SCOTTISH PLANNING POLICY

Scottish Planning Policy (SPP 2010) provides statements of Government policy in relation to Scotland's Natural Heritage. It notes that in paragraph 129, all public bodies, including planning authorities, have a duty to further the conservation of biodiversity under the Nature Conservation (Scotland) Act 2004, and this should be reflected in development plans and development management decisions.

Paragraph 131 highlights "Statutory natural heritage designations are important considerations where they are directly or indirectly affected by a development proposal". Planning policy regarding international, national and local designated sites is covered in paragraphs 134-141 and highlights the significance of sites in relation to potential planning constraints.

Paragraph 143 relates to European protected species and states;

Planning permission must not be granted for development that would be likely to have an adverse effect on a European protected species unless the planning authority is satisfied that:

- there is no satisfactory alternative, and
- the development is required for preserving public health or public safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.

Paragraph 144 relates to species listed under the Wildlife and Countryside Act (1981 as amended) and states planning permission must not be granted for development that would be likely to have an adverse effect on a species unless the development is required for preserving public health or public safety.

Paragraph 126 of SPP states;

"Planning authorities should take a broader approach to landscape and natural heritage than just conserving designated or protected sites and species, taking into account the ecosystems and natural processes in their area. A strategic approach to natural heritage in which wildlife sites and corridors, landscape features, watercourses, and areas of open space are linked together in integrated habitat networks can make an important contribution to the maintenance and enhancement of biodiversity and to allowing ecosystems and natural processes to adapt and respond to changes in the climate"

C.2 ENGLISH PLANNING POLICY

The table below details the key paragraphs from the National Planning Policy Framework (NPPF)⁵ relating to the natural environment:

TABLE 1: NATIONAL PLANNING POLICY FRAMEWORK: NATURAL ENVIRONMENT	
Statement	Paragraph
Planning policies and decisions should contribute to and enhance the natural and local environment by: <ul style="list-style-type: none"> a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan); b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland; c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate; 	170

⁵ National Planning Policy Framework (March 2012), Department for Communities and Local Government,

<ul style="list-style-type: none"> d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures; e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate. 	
<p>Plans should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework⁶; take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure; and plan for the enhancement of natural capital at a catchment or landscape scale across local authority boundaries.</p>	171
<p>Great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks, the Broads and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to these issues. The conservation and enhancement of wildlife and cultural heritage are also important considerations in these areas, and should be given great weight in National Parks and the Broads⁷. The scale and extent of development within these designated areas should be limited. Planning permission should be refused for major development⁸ other than in exceptional circumstances, and where it can be demonstrated that the development is in the public interest. Consideration of such applications should include an assessment of:</p> <ul style="list-style-type: none"> a) the need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy; b) the cost of, and scope for, developing outside the designated area, or meeting the need for it in some other way; and c) any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated. 	172
<p>Within areas defined as Heritage Coast (and that do not already fall within one of the designated areas mentioned in paragraph 172), planning policies and decisions should be consistent with the special character of the area and the importance of its conservation. Major development within a Heritage Coast is unlikely to be appropriate, unless it is compatible with its special character.</p>	173
<p>To protect and enhance biodiversity and geodiversity, plans should:</p> <ul style="list-style-type: none"> a) Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity⁹; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation¹⁰; and b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity. 	174
<p>When determining planning applications, local planning authorities should apply the following principles:</p> <ul style="list-style-type: none"> a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), b) adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused; c) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other 	175

⁶ Where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality.

⁷ English National Parks and the Broads: UK Government Vision and Circular 2010 provides further guidance and information about their statutory purposes, management and other matters.

⁸ For the purposes of paragraphs 172 and 173, whether a proposal is 'major development' is a matter for the decision maker, taking into account its nature, scale and setting, and whether it could have a significant adverse impact on the purposes for which the area has been designated or defined.

⁹ Circular 06/2005 provides further guidance in respect of statutory obligations for biodiversity and geological conservation and their impact within the planning system.

¹⁰ Where areas that are part of the Nature Recovery Network are identified in plans, it may be appropriate to specify the types of development that may be suitable within them.

<p>developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;</p> <p>d) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons¹¹ and a suitable compensation strategy exists; and</p> <p>e) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.</p>	
<p>The following should be given the same protection as habitats sites:</p> <p>a) potential Special Protection Areas and possible Special Areas of Conservation;</p> <p>b) listed or proposed Ramsar sites¹²; and</p> <p>c) sites identified, or required, as compensatory measures for adverse effects on habitats sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites.</p>	176
<p>The presumption in favour of sustainable development does not apply where development requiring appropriate assessment because of its potential impact on a habitats site is being planned or determined.</p>	177

Section 40 of the Natural Environment and Rural Communities Act 2006, places a duty on all public authorities in England and Wales to have regard, in the exercise of their functions, to the purpose of conserving biodiversity.

Planning Practice Guidance¹³ states:

- *'The National Planning Policy Framework 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 and reducing pollution' (para. 007).*
- *'Information on biodiversity impacts and opportunities should inform all stages of development An ecological survey will be necessary in advance of a planning application if the type and location of development are such that the impact on biodiversity may be significant and existing information is lacking or inadequate' (para. 016).*
- *'Where an Environmental Impact Assessment is not needed it might still be appropriate to undertake an ecological survey, for example, where protected species may be present' (para. 016).*
- *'Local planning authorities should only require ecological surveys where clearly justified, for example if they consider there is a reasonable likelihood of a protected species being present and affected by development. Assessments should be proportionate to the nature and scale of development proposed and the likely impact on biodiversity' (para. 016).*
- *'Biodiversity enhancement in and around development should be led by a local understanding of ecological networks, and should seek to include:*
 - *habitat restoration, re-creation and expansion;*
 - *improved links between existing sites;*
 - *buffering of existing important sites;*
 - *new biodiversity features within development; and*
 - *securing management for long term enhancement' (para. 017).*

¹¹ For example, infrastructure projects (including nationally significant infrastructure projects, orders under the Transport and Works Act and hybrid bills), where the public benefit would clearly outweigh the loss or deterioration of habitat.

¹² Potential Special Protection Areas, possible Special Areas of Conservation and proposed Ramsar sites are sites on which Government has initiated public consultation on the scientific case for designation as a Special Protection Area, candidate Special Area of Conservation or Ramsar site.

¹³ Planning Practice Guidance: Natural Environment (www.planningguidance.communities.gov)

C.3 SCOTTISH PROTECTED SPECIES LEGISLATION

The table below details the relevant legislation for those protected species that may be present on this site.

TABLE 2: SUMMARISED PROTECTED SPECIES LEGISLATION		
Species	Relevant Legislation	Level of Protection
Bats (All species)	<ul style="list-style-type: none"> Classified as European protected species and given full protection under the Conservation (Natural Habitats, &c.) Regulations 1994 and Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007. Bats are also protected by the Wild Mammals (Protection) Act 1996 	<p>Under the Conservation (Natural Habitats, &c.) Regulations 1994 and the Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007 it is an offence to:</p> <ul style="list-style-type: none"> deliberately or recklessly capture, kill, injure, or take a wild individual of these species. deliberately or recklessly harass a wild individual of these species. deliberately or recklessly disturb a wild individual of these species when occupying a place used for rest or protection or when rearing or otherwise caring for young deliberately or recklessly disturb a wild individual of these species in a manner which is likely to significantly affect the local distribution or abundance of the species, or impair an individual's ability to survive, breed or reproduce, or rear its young. deliberately or recklessly damage, destroy or obstruct access to a breeding site or resting place used by a wild individual of these species.
Otter	<ul style="list-style-type: none"> Classified as European protected species and given full protection under the Conservation (Natural Habitats, &c.) Regulations 1994 and Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007. Otters are also protected by the Wild Mammals (Protection) Act 1996 	<ul style="list-style-type: none"> deliberately or recklessly disturb a wild individual of these species in a manner which is likely to significantly affect the local distribution or abundance of the species, or impair an individual's ability to survive, breed or reproduce, or rear its young. deliberately or recklessly damage, destroy or obstruct access to a breeding site or resting place used by a wild individual of these species.
Birds	<ul style="list-style-type: none"> Protection under the Wildlife and Countryside Act (1981) as amended with the exception of some species listed in Schedule 2 of the Act 	<p>The WCA (1981) makes it an offence to (with exceptions for certain species):</p> <ul style="list-style-type: none"> Intentionally kill, injure or take any wild bird Intentionally take, damage or destroy nests in use or being built (including ground nesting birds) Intentionally take, damage or destroy eggs Species listed on Schedule 1 of the WCA or their dependant young are afforded additional protection from disturbance whilst they are at their nests
Red Squirrel	<ul style="list-style-type: none"> Full protection under the Wildlife and Countryside Act (WCA) (1981) (Listed on Schedule 5) - as amended 	<p>The WCA (1981) makes it an offence to:</p> <ul style="list-style-type: none"> intentionally kill, injure, or take red squirrels intentionally or recklessly damage, destroy or obstruct access to any place used by the animal for shelter or protection or disturb red squirrels whilst they are using such a place.
Badger	<ul style="list-style-type: none"> Protected under the Protection of Badgers Act 1992 as amended by the Wildlife and Natural Environment (Scotland) Act 2011 	<p>It is an offence intentionally or recklessly to:</p> <ul style="list-style-type: none"> kill, injure, take, possess or cruelly ill-treat a badger or to attempt to do so interfere with a sett by damaging or destroying it obstruct access to, or any entrance of, a badger sett disturb a badger whilst it is occupying a sett cause a dog to enter a sett sell a live badger or offer one for sale or possess a live badger be in possession or control of a dead badger or anything derived from a dead badger

TABLE 2: SUMMARISED PROTECTED SPECIES LEGISLATION		
Species	Relevant Legislation	Level of Protection
Water Vole	<ul style="list-style-type: none"> Habitat protected by the Wildlife and Countryside Act (1981) as amended 1998. Water voles are also protected by the Wild Mammals (Protection) Act 1996 	<p>The WCA (1981) makes it an offence to:</p> <ul style="list-style-type: none"> Intentionally or recklessly damage or destroy or obstruct access to any place or structure which water voles use for shelter or protection Disturb water voles whilst they are using such a place
White-clawed Crayfish	<ul style="list-style-type: none"> Partially protected by the Wildlife and Countryside Act (1981) 	<p>The WCA (1981) makes it an offence to:</p> <ul style="list-style-type: none"> Take a white-clawed crayfish from its habitat <p>Sell, offer for sale, advertise for sale, possess or transport for the purposes of selling any live or dead white clawed crayfish</p>
Common reptiles (Slow-worm, Adder, Grass Snake, Common Lizard)	<ul style="list-style-type: none"> Partially protected by the Wildlife and Countryside Act 	<p>The WCA (1981) makes it an offence to:</p> <ul style="list-style-type: none"> intentionally kill or injure these animals <p>Sell, offer for sale, advertise for sale, possess or transport for the purposes of selling any live or dead animals or part of these animals</p>
<p><i>Under the Nature Conservation (Scotland) Act 2004 the offence in section 9(4) of the Wildlife and Countryside Act 1981 of damaging a place of shelter or disturbing those species given full protection under the act is extended to cover reckless damage or disturbance.</i></p>		

C.4 ENGLISH PROTECTED SPECIES LEGISLATION

The table below details the relevant legislation for those protected species that may be present on this site.

TABLE 3: SUMMARISED SPECIES LEGISLATION		
Species	Relevant Legislation	Level of Protection
Bats (All species)	<ul style="list-style-type: none"> Protection under the Wildlife and Countryside Act (WCA) (1981) (Listed on Schedule 5) - as amended Classified as European protected species under Conservation of Habitats and Species Regulations 2017 Bats are also protected by the Wild Mammals (Protection) Act 1996 	<p>The WCA (1981) and Conservation of Habitats and Species Regulations 2017 make it an offence to:</p> <ul style="list-style-type: none"> Intentionally kill, injure, or take any species of bat Intentionally or recklessly disturb bats Intentionally or recklessly damage destroy or obstruct access to bat roosts
Otter	<ul style="list-style-type: none"> Protection under the Wildlife and Countryside Act (WCA) (1981) (Listed on Schedule 5) - as amended Classified as European protected species under Conservation of Habitats and Species Regulations 2017 Otters are also protected by the Wild Mammals (Protection) Act 1996 	<p>The WCA (1981) and Conservation of Habitats and Species Regulations 2017 make it an offence to:</p> <ul style="list-style-type: none"> intentionally kill, injure, or take otters intentionally or recklessly disturb otters intentionally or damage destroy or obstruct access to otter holts or any place used by the animal for shelter or protection
Red Squirrel	<ul style="list-style-type: none"> Full protection under the Wildlife and Countryside Act (WCA) (1981) (Listed on Schedule 5) - as amended Red squirrels are also protected by the Wild Mammals (Protection) Act 1996 	<p>The WCA (1981) makes it an offence to:</p> <ul style="list-style-type: none"> intentionally kill, injure, or take red squirrels intentionally or recklessly damage destroy or obstruct access to any place used by the animal for shelter or protection or disturb red squirrels whilst they are using such a place.

TABLE 3: SUMMARISED SPECIES LEGISLATION

Species	Relevant Legislation	Level of Protection
Birds	<ul style="list-style-type: none"> Protection under the Wildlife and Countryside Act (1981) as amended with the exception of some species listed in Schedule 2 of the Act 	<p>The WCA (1981) makes it an offence to (with exceptions for certain species):</p> <ul style="list-style-type: none"> Intentionally kill, injure or take any wild bird Intentionally take, damage or destroy nests in use or being built (including ground nesting birds) Intentionally take, damage or destroy eggs Species listed on Schedule 1 of the WCA or their dependant young are afforded additional protection from disturbance whilst they are at their nests
White-clawed Crayfish	<ul style="list-style-type: none"> Partially protected by the Wildlife and Countryside Act (1981) 	<p>The WCA (1981) makes it an offence to:</p> <ul style="list-style-type: none"> Take a white-clawed crayfish from its habitat Sell, offer for sale, advertise for sale, possess or transport for the purposes of selling any live or dead white clawed crayfish
Badger	<ul style="list-style-type: none"> Protection of Badgers Act 1992 Badgers are also protected by the Wild Mammals (Protection) Act 1996 	<p>The Protection of Badgers Act (1992) makes it an offence to intentionally or recklessly:</p> <ul style="list-style-type: none"> Damage a badger sett or any part of it Destroy a badger sett Obstruct access to, or any entrance of a badger sett Disturb a badger whilst it is occupying a badger sett
Water Vole	<ul style="list-style-type: none"> Full protection under the Wildlife and Countryside Act (WCA) (1981) (Listed on Schedule 5) - as amended Water voles are also protected by the Wild Mammals (Protection) Act 1996 	<p>The WCA (1981) makes it an offence to:</p> <ul style="list-style-type: none"> intentionally kill, injure, or take water voles intentionally or recklessly damage destroy or obstruct access to any place used by the animal for shelter or protection or disturb water voles whilst they are using such a place
Common reptiles (Slow-worm, Adder, Grass Snake, Common Lizard)	<ul style="list-style-type: none"> Partially protected by the Wildlife and Countryside Act 	<p>The WCA (1981) makes it an offence to:</p> <ul style="list-style-type: none"> intentionally kill or injure these animals Sell, offer for sale, advertise for sale, possess or transport for the purposes of selling any live or dead animals or part of these animals
<p><i>Under the Countryside and Rights of Way Act 2000 (CROW Act) the offence in section 9(4) of the Wildlife and Countryside Act 1981 of damaging a place of shelter or disturbing those species given full protection under the act is extended to cover reckless damage or disturbance.</i></p>		

C.5 INVASIVE SPECIES LEGISLATION

The table below details the legislation in relation to invasive species and lists those invasive species most likely to be found in this region.

TABLE 4: SUMMARISED INVASIVE SPECIES LEGISLATION		
Relevant Legislation	Description of Offence	Species (Covered by the Legislation and most likely to be found in this Region)
Listed on Part II of Schedule 9 of the Wildlife and Countryside Act (1981 as amended)	Section 14 of the WCA (1981) states: <ul style="list-style-type: none"> if any person plants or otherwise causes to grow in the wild any plant which is included in Part II of Schedule 9, he shall be guilty of an offence. 	Himalayan balsam Cotoneaster Montbretia Japanese knotweed Giant hogweed Rhododendron

C.6 WILDLIFE SITE POLICY AND LEGISLATION

Details of the legislation surrounding protected sites are provided in the appendices.

C.7 PRIORITY SPECIES

Although not afforded any legal protection, national priority species (species of principal importance, as listed in Section 41 of the NERC Act (2006)), and local and regional priority species, as detailed within the relevant biodiversity action plans, are material considerations in the planning process and as such have been assessed accordingly within this report.

The table below details the local biodiversity action plan relevant to the area within which this site lies, and the species/species groups and habitats listed as priorities within the plan.

TABLE 5: BIODIVERSITY ACTION PLAN					
Northumberland Biodiversity Action Plan					
Species			Habitats		
Barn Owl	Bats	Black Grouse	Blanket Bog	Built Environment	Brownfield Land
Coastal Birds	Common Seal	Dingy Skipper	Calaminarian Grassland	Coastal heathland	Fen, Marsh & Swamp
Dormouse	Farmland Birds	Freshwater Fish	Gardens & Allotments	Heather Moorland	Lowland Heathland
Freshwater Pearl Mussel	Garden Birds	Great Crested Newt	Lowland Meadows & Pastures	Maritime Cliffs & Slopes	Native Woodland
Grey Seal	Hedgehog	Otter	Ponds, Lakes & Reservoirs	Recreational & Amenity Space	Reedbed
Red Squirrel	River Jelly Lichen	Upland Waders	Rivers & Streams	Rocky Shore, Reefs & Islands	Saline Lagoons
Violet Crystalwort	Water Rock-bristle	Water Vole	Saltmarsh & Mudflat	Sand Dunes	Transport Corridors
White-Clawed Crayfish			Trees & Hedgerows	Upland Hay Meadows	Whin Grassland
Scottish Borders Biodiversity Action Plan					
Species*			Habitats		
Atlantic Salmon	Lamprey	Allis Shad	Maritime Cliff And Slope	Calcareous Grasslands	Acid Grasslands
Brown Trout	Adder	Slow Worm	Rush Pasture	Hedgerows	Arable Margins
Great Crested Newt	Common Frog	Black Grouse	Native Woodland	Wood Pasture And Parkland	Upland Cleuch And Scrub Woodland
Grey Partridge	Skylark	Spotted Flycatcher	Coniferous Woodland	Rivers And Burns	Lowland Raised Bogs

TABLE 5: BIODIVERSITY ACTION PLAN

Tree Sparrow	Yellow Hammer	Bullfinch	Standing Open Water	Fens, March Swamp And Reedbed	Upland Heath
Reed Bunting	Hen Harrier	Merlin	Blanket Bog	Montane	
Black-Necked Grebe	Shag	Greylag Goose			
Lapwing	Kittiwake	Swift			
Curlew	Barn Owl	Kingfisher			
March Tit	Short Eared Owl	Ring Ousel			
House Sparrow	Brown Hare	BLE			
Harbour Porpoise	Otter	Water Vole			
Red Squirrel					
*Fish, Amphibian, Reptile, Mammal and bird species only are shown. For full list of 100 border species please refer to Scottish Borders Council LBAP					

D. METHODOLOGY

D.1 SCOPE OF STUDY

The scope of the study, in terms of the survey area and the desk study area, is based on professional judgement. The likely zone of influence of the proposal has been considered, including both potential direct effects such as habitat loss and potential indirect effects such as disturbance. Consideration has been given to potential effects both during the construction and operational phases of the development.

For this site the survey area comprised the red line survey boundary as defined within the figure below with, in addition, a 50m buffer around the periphery appraised where access was available. The survey area included all potential roost sites within and adjacent to the survey area, which may be affected by the proposals.

The desk study included an assessment of land-use in the surrounding area and a data search covering a 2km buffer zone (see below for further detail).

The following types of ecological receptors have been considered:

- Statutorily designated sites for nature conservation
- Non-statutorily designated sites for nature conservation
- Species protected by law
- Species and/or habitats listed under the NERC Act (2009) as being of principal importance for conservation of biodiversity
- Species and/or habitats listed in relevant local biodiversity action plans

The level of survey effort employed at the site has taken account of the recommendations within the Bat Conservation Trust Good Practice Survey Guidelines¹⁴.

The figures below firstly illustrate the site boundary and secondly, to provide context, the broad habitats present on site and within an approximate 500m buffer zone.

¹⁴ Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust



FIGURE 2: SITE BOUNDARY
(Reproduced under licence from Google Earth Pro.)



FIGURE 3: SITE AND SETTING
(Reproduced under licence from Google Earth Pro.)

D.2 DESK STUDY

Initially, the site was assessed from aerial photographs and 1:25'000 Ordnance Survey maps. Following this, a search was made of the MAGIC website¹⁵ for all statutorily protected sites for nature conservation within 2km of the survey area.

¹⁵ Multi Agency Geographic Information for the Countryside (www.magic.gov.uk)

D.3 PRELIMINARY FIELD STUDY METHODOLOGY

D.3.1 PHASE 1 HABITAT SURVEY

The field survey of the proposed site was conducted using the methodology of the Joint Nature Conservation Committee's Phase 1 Habitat Survey, as outlined in their habitat-mapping manual¹⁶. Each parcel of land was assessed by a trained surveyor and classified as one of ninety habitat types. These were then mapped and the habitat information supplemented by dominant and indicator species codes and target notes where appropriate. Where areas within the study area do not fall into the Phase 1 Habitat Survey classification, alternative methods of classification have been used.

D.3.2 PRELIMINARY PROTECTED AND PRIORITY SPECIES APPRAISAL

Where there is a risk of legally protected species and/or otherwise notable species¹⁷ being present, an initial appraisal was completed to inform the proposals. This appraisal included the following key elements:

- Structures and trees were assessed for the risk of supporting roosting bats and the potential suitability of the habitat for in relation to commuting and foraging activity by these species was also considered (see below).
- Wetlands, where present, were reviewed for their potential use by great crested newt, otter and water voles,
- If present, any trackways regularly used by badger were noted and any badger sett usage assessed by the presence of freshly dug earth or bedding at the entrance.
- The suitability of the suite of habitats present for use by reptiles was assessed.
- Likely use of the site by birds was assessed from the species seen during the survey, and the habitats present.
- Potential use by otherwise notable species was determined based on the broad habitat types present on site, any recent records obtained through the desk study and the geographical distribution of the species. Where specific habitat requirements for notable species have been recorded on site these have been noted, and used as part of this appraisal. The species groups assessed are limited to birds, freshwater fish, amphibians, reptiles, terrestrial mammals, butterflies and dragonflies.

Where it is considered likely that there is a significant risk of protected or otherwise notable species being affected or where habitats are of particularly high value additional specialist survey work has been recommended. Further survey work may also be recommended where development proposals have the potential to affect statutorily designated sites in the vicinity.

D.3.3 HABITAT SUITABILITY ASSESSMENT (BATS)

The potential suitability of the habitats within the survey area in relation to commuting and foraging bats was classified as negligible, low, moderate or high, based on guidelines provided by the Bat Conservation Trust¹⁸ and detailed within the table below:

¹⁶ Handbook for Phase 1 habitat survey, A Technique For Environmental Audit, JNCC, 2010

¹⁷ To include national priority species as listed in Section 41 of the NERC Act (2006) and local or regional priority species as listed within the relevant Biodiversity Action Plan

¹⁸ Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust

TABLE 6: GUIDELINES FOR ASSESSING THE POTENTIAL SUITABILITY OF PROPOSED DEVELOPMENT SITES FOR BATS, BASED ON PRESENCE OF HABITAT FEATURES WITHIN THE LANDSCAPE. (TO BE APPLIED USING PROFESSIONAL JUDGEMENT, TABLE 4.1 BAT SURVEY GUIDELINES)	
Suitability	Communing and foraging habitats
Negligible	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland tree lined watercourses and grazed parkland. Site is close to and connected to known roosts.

D.3.4 DAYTIME BAT RISK ASSESSMENT (STRUCTURES)

A daytime assessment was made of all structures affected by the proposed development, in order to evaluate their potential for supporting bat roosts, and, where present, to record signs of use by bats.

Externally, the buildings were examined for potential roost access points indicated by clean crevices, urine marks, polished wood or stonework and droppings. Particular attention was given to sheltered areas where droppings are less likely to have been washed off.

Structures were categorised as having negligible, low, moderate or high suitability to be used by roosting bats, based on guidelines provided by the Bat Conservation Trust¹⁹ and detailed within the table below:

TABLE 7: GUIDELINES FOR ASSESSING THE POTENTIAL SUITABILITY OF PROPOSED DEVELOPMENT SITES FOR BATS, BASED ON PRESENCE OF ROOSTING HABITAT FEATURES (STRUCTURES) (TO BE APPLIED USING PROFESSIONAL JUDGEMENT, TABLE 4.1 BAT SURVEY GUIDELINES)	
Suitability	Roosting Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).

¹⁹ Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust

High	A structure with one or more potential roost site that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
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The bat risk assessment of the structures was undertaken on 25th June 2018.

Note that comments on the state of the structures within the site relate solely to their potential use by bats and must not be taken as a professional assessment of the structural integrity or safety of the structures. For example, descriptions of walls and roofs being in 'good' or 'poor condition' relate to likely provision of roost sites for bats, potential access routes to roost sites, and likely persistence of field signs such as droppings and feeding remains, which will not persist in exposed conditions. Maternity roosts are less likely to be present in cool, exposed, damp and draughty locations which may develop in a building in poor condition.

D.3.5 DAYTIME GROUND BASED BAT RISK ASSESSMENT (TREES)

A preliminary assessment was made, based on inspection from within the site boundaries, of any trees affected by the proposed development. Trees were inspected and assessed for their potential to support roosting bats and were categorised as negligible, low, moderate or high suitability for roosting bats based on guidelines provided within the Bat Conservation Trust Bat Survey: Good Practice Guidelines²⁰ and detailed within the table below.

TABLE 8: GUIDELINES FOR ASSESSING THE POTENTIAL SUITABILITY OF PROPOSED DEVELOPMENT SITES FOR BATS, BASED ON PRESENCE OF ROOSTING HABITAT FEATURES (TREES) (TO BE APPLIED USING PROFESSIONAL JUDGEMENT, TABLE 4.1 BAT SURVEY GUIDELINES)	
Suitability	Roosting Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.
Low	A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential.
Moderate	A tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
High	A tree with one or more potential roost site that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

The assessment is based upon the age and species of the tree, the presence of features with potential to support roosting bats and the location of the tree and habitats present in the surrounding area. Any potential roosting locations and field signs that could indicate bat use, such as droppings, staining and scratch marks were noted.

The ground based tree survey was undertaken on 25th June 2018.

D.3.6 PRELIMINARY SURVEY/RISK ASSESSMENT - EQUIPMENT

- High power LED torch.
- Olympus 8 x 32 binoculars
- Digital camera

²⁰ Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust

D.3.7 PRELIMINARY SURVEY/RISK ASSESSMENT - ENVIRONMENTAL CONDITIONS

TABLE 9: DAYTIME SURVEY CONDITIONS				
DATE	TEMPERATURE	CLOUD COVER	PRECIPITATION	WIND CONDITIONS
25.06.18	25°C	0	0	0

D.3.8 PRELIMINARY SURVEY/RISK ASSESSMENT - CONSTRAINTS

Survey was undertaken at a time of year when trees were in full leaf and this may have obscured the view of some potential roost features.

D.4 DETAILED SURVEY METHODOLOGY

D.4.1 AERIAL TREE SURVEY

Aerial tree surveys are undertaken by surveyors licenced to handle and disturb bats. Where ground based survey has identified trees as being of moderate or high suitability for use by roosting bats, these trees are accessed using ropes and a visual inspection is undertaken. Features of interest may include torsional cracks, splits in limbs, loose bark, rot holes, woodpecker holes and features influenced by fungal decay. Such features are inspected using a torch or endoscope, where required, to look for bats themselves or field signs. Where bats or field signs are recorded, the feature is photographed and if possible the species of bat is identified.

The aerial tree survey was undertaken on 1st August 2018.

D.4.1.1 AERIAL TREE SURVEY CONSTRAINTS

Tree 3 and 4 could not be fully inspected due to the presence of a live overhead wire presenting a health and safety constraint.

D.4.2 BADGER SURVEY

Badger survey can be undertaken at any time of year although the optimum time is in early spring or late autumn when badgers are active but there is less vegetation to hide field signs²¹.

Within the survey area, all accessible fence lines, woodland and scrub habitats were systematically searched for the following field signs:

- sett entrances, e.g. entrances that are normally 25 to 35cm in diameter and shaped like a 'D' on its side, with those dimensions being maintained at depth
- large spoil heaps outside sett entrances
- bedding or hair outside sett entrances
- badger footprints
- badger paths
- latrines
- badger hairs on fences or bushes
- scratching posts
- signs of digging for food

When found, activity level at setts was scored using the following criteria²¹:

- Number of well-used holes (with one or more of the features: well-worn entrance, freshly excavated soil and bedding material).

²¹ Scottish Natural Heritage (2003) *Best Practice Guidance – Badger Surveys*.

- Number of partially used holes (leaves or twigs in entrance and/ or mosses and other plants growing in or around the entrance).
- Number of disused holes (partially or completely blocked, with considerable amounts of excavation required for reoccupation).

The badger walkover survey was undertaken on 1st August 2018.

D.4.2.1 *BADGER SURVEY CONSTRAINTS*

Badger survey was undertaken at a time of year when dense scrub was present which may have obscured some field signs.

D.4.3 OTTER SURVEY

Otter themselves are rarely seen with field signs used to establish their presence. These include: tracks, spraint, pathways and slides to and from waterbodies, feeding remains and above and underground shelters. Due to their elusive nature, the absence of signs does not necessarily signify that otter are not present.

Otter spraint and anal jelly can often be found on significant landmarks including bridges, islands, boulders, novel manmade objects, prominent tree roots, fallen logs or grassy tussocks both within and adjacent to watercourse. Spraint is readily identified by an experienced surveyor due to its appearance and distinctive smell.

The density of sprainting sites within a watercourse can be highly variable depending on the otters range, the time of year, the quality of the watercourse and whether the otter has dependent offspring.

Above ground resting places are referred to as *couches*, whilst underground shelters are termed *holt sites*. Infrequently, the term *hover* is used where an otter has rested but not altered the habitat. These areas can be identified as having been used by otter through the presence of spraint and footprints.

Holt sites are more frequently attributed to females with young and can be distant from a watercourse. These sites are often within natural cavities including under waterside trees with well-developed root systems but also can be found associated with man-made structures including gabions.

Survey was undertaken of 150m up and downstream of the bridge on both banks. All potential sprainting sites and resting areas were recorded. Where potential holt sites were identified, tracks and field signs were used to deduce the likelihood of otter usage.

Survey was undertaken on 1st August 2018.

D.4.3.1 *OTTER SURVEY CONSTRAINTS*

Survey was undertaken in late July when overhanging vegetation may have obscured some field signs. Survey was undertaken from within the watercourse however allowing the area under vegetation to be thoroughly searched.

D.4.4 DUSK EMERGENCE/DAWN SWARMING ACTIVITY SURVEY

D.4.4.1 SURVEY EFFORT

The level of survey effort employed has taken account of the guidance provided by the Bat Conservation Trust (BCT)²² and summarised within the table below.

TABLE 10: RECOMMENDED NUMBER AND TIMING OF PRESENCE/ABSENCE SURVEY VISITS REQUIRED TO PROVIDE CONFIDENCE IN NEGATIVE PRELIMINARY ROOST ASSESSMENT RESULTS (FROM TABLE 7.1 AND TABLE 7.3 BCT GUIDELINES)			
	Low Roost Suitability*	Moderate Roost Suitability	High Roost Suitability
Recommended minimum number of survey visits for presence/absence survey to give confidence in a negative result	One survey visit. One dusk emergence or dawn re-entry survey (structures). For trees with low roost suitability, no further surveys required.	Two separate survey visits. One dusk emergence and a separate dawn re-entry survey.	Three separate survey visits. At least one dusk emergence and a separate dawn re-entry survey. The third visit could be either dusk or dawn.
Recommended timings for presence/absence surveys	May to August	May to September with at least one of the surveys between May and August	May to September with at least two of the surveys between May and August
* If a structure is classified as having low suitability for bats an ecologist should make a professional judgement on how to proceed based on all of the evidence available. If sufficient areas of a structure have been inspected and no evidence found (and is unlikely to have been removed by weather or cleaning or be hidden), then further surveys may not be appropriate.			
Note: Where a roost is confirmed as being present, further surveys may be required to fully characterise the roost			

The recommendations provided above are guidelines and it is recognised by BCT that ‘the number of visits could be adjusted (up or down) if necessary by the ecologist, bearing in mind the site-specific circumstances’.

In this case, from the preliminary daytime inspection, the mason towers within the site were concluded to have moderate roost potential. As such one dusk emergence survey and one dawn re-entry survey was undertaken. The section of bridge spanning the river was considered to be of low suitability and was surveyed during the dusk survey.

Activity surveys were undertaken on the dates in the table below. Details of timings, and surveyor numbers and names are provided in the appendices.

TABLE 11: ACTIVITY SURVEY	
DATE	DUSK OR DAWN
25.06.18	Dusk
02.08.18	Dawn

D.4.4.2 SURVEY METHODS

Activity surveys were undertaken in suitably mild conditions when bats are active. Surveyor locations sought to box-in the site and give a good degree of confidence as to whether bats were flying into or out of the survey area.

²² Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust

Light levels were recorded at 5 minute intervals, using a light meter, located in an open area and directed upwards to ensure a standard baseline. Light levels generally provide a more reliable indicator of the likely times for bat emergence than minutes past sunset and this approach is recommended by BCT²³. There is significant variation in emergence times, but hundreds of surveys by E3 in northern England over recent years have indicated that pipistrelles are likely to start emerging around 70 lux, noctule at a similar level or earlier, *Myotis* bats generally start to emerge below 10 lux, with most *Myotis* activity and brown long-eared emergence below 2lux. Bats are rarely recorded above 150 lux, and as light levels go below 0.5 lux bat activity in the vicinity of the roosts tends to decrease as bats disperse across the wider countryside. Bat emergence will start at higher light levels when there is good cover close to the roost. For example *Myotis* bats have been recorded emerging in light conditions above 50 lux when there is a short flight line from the roost site to dense woodland. If a species is recorded when light levels are close to expected emergence light levels, then the likelihood that a roost is nearby is greatly increased.

Surveyors were positioned to ensure coverage of all high-risk areas of the site, including any potential flight-lines from structures within the site to adjacent cover such as woodland blocks. If bats were recorded within the site before bats were seen in the wider area, or seen flying into the site, it is assumed that roosts are present within the site.

All surveyors used both Batbox Duet bat detectors to listen for bats and Anabat Express detectors, at each surveyor location, to record and better identify bat species. Listening through earphones to both heterodyne and frequency division signals helps ensure that all bat species were detected²⁴, whilst recording all bat activity using the Express removes the risk of surveyor error in timings and species ID.

Timings for observations of key bat activity such as emergence, first records of each species and commuting routes were recorded using radio-wave synchronised clocks. All data were recorded using the Anabat Express for future reference and to allow confirmation of species identification through call analysis (using Analook software), and to capture brief echolocation calls that could not be reliably identified in the field²⁵. Field survey recorded numbers of bats detected, feeding activity, flight paths, species (as far as is practicable), and social calls.

A total of 8 person-nights work was undertaken. Figures provided within the results section of this report illustrate the approximate location of each surveyor and monitoring point.

D.4.4.3 DUSK EMERGENCE/DAWN SWARMING SURVEY – ENVIRONMENTAL CONDITIONS

Details of the environmental conditions for each activity survey are provided within the appendices.

D.4.4.4 SURVEY EQUIPMENT

- Duet bat detector
- Anabat Express

²³ http://www.bats.org.uk/pages/recording_light_level_data.html

²⁴ Listening to frequency division calls as well as heterodyne significantly increases the detection rate of *Nyctalus* species

²⁵ Reviewing data recorded by surveyors using Duet detectors and the Anabat data indicated that reliable *Myotis* records increased through Anabat use, particularly once conditions were too dark for visual cues to assist in identification, when there was a lot of bat activity, and with bats in clutter. It also reduces errors where pipistrelles in clutter can be mis-identified as *Myotis* bats.

D.4.5 SURVEY CONSTRAINTS

Access to the bottom of the bridge on the English (right hand) side of the river could not be safely accessed during the bat activity surveys due to steep sloping banks and dense vegetation. As such it was viewed from the Scottish (left hand) side and activity was cross referenced between surveyors where possible.

D.4.6 DATA ANALYSIS

All bat calls were analysed using Analook with calls identified to species where possible, referencing call parameters as detailed within Russ (2012)²⁶ and Middleton et al (2014)²⁷.

Species from the *Myotis* genus of bats produce frequency modulated calls with overlapping call parameters and cannot be reliably distinguished to species level on call alone. As such, within this report, *Myotis* calls are identified as '*Myotis ?species*', with the most likely species identified through an assessment of a combination of call slope, loudness, frequency range, habitat and, where the bat was observed in flight, flight characteristics. Where insufficient information is available, calls are simply identified as '*Myotis sp.*'.

Bats from the pipistrelle genus also produce calls with overlapping parameters and the call criteria used to differentiate between species of this genus, based on peak frequencies, are detailed within the table below.

TABLE 12: PIPISTRELLE SPECIES IDENTIFICATION PARAMETERS	
Species	Call Peak Frequency Range (KHz)
Common pipistrelle	>42 and <49
Soprano pipistrelle	≥51
Nathusius' pipistrelle	<40
Common or soprano pipistrelle ('50KHz pip')	≥49 and <51
Common or Nathusius' pipistrelle ('40KHz pip')	≥40 and ≤42

Similarly, bats of the *Nyctalus* genus produce calls with overlapping call parameters. Where calls are obtained in an open environment, the two *Nyctalus* species found in this region can be differentiated and calls will be identified as noctule or Leisler's bat. Where there is doubt, calls are noted as *Nyctalus sp.*.

Within this report, for all species, if the species name is given without qualification, the record was of good quality and fell within recognised parameters with no potential overlap with other species present in the region. If there is a degree of uncertainty this is indicated by a question mark, e.g. ?brown long-eared. If identification to species is not practicable, then where possible calls are identified to genus.

D.5 PERSONNEL

The table below details the personnel who undertook the survey work and/or lead activity surveys. Details of other surveyors who assisted with activity surveys are provided in the appendices.

TABLE 13: PERSONNEL			
Name	Position	Professional Qualifications	Natural England Survey Licence Numbers
Mike Perkins	Ecologist	BSc MSc	2018-34088-CLS-CLS
Hannah Norman	Ecologist	BSc MSc GradCIEEM	2018-33610-CLS-CLS-1

²⁶ Russ, J. (2012) British Bat Calls: A Guide to Species Identification. Pelagic Publishing

²⁷ Middleton, N., Froud, A. and French, K. (2014) Social Calls of the Bats of Britain and Ireland. Pelagic Publishing

Further details of experience and qualifications are available at www.e3ecology.co.uk.

D.6 ASSESSMENT METHODOLOGY

The relative value of the ecological receptors (habitats, species and designated sites) was assessed using a geographical frame of reference. For designated sites this is generally a straightforward process with the assigned designation generally being indicative of a particular value, e.g. Sites of Special Scientific Interest are designated under national legislation and are therefore generally considered to be receptors of national value. The assignment of value to non-designated receptors is less straightforward and as recognised by the Guidelines for Ecological Impact Assessment produced by the Chartered Institute of Ecology and Environmental Management²⁸, is a complex and subjective process and requires the application of professional judgement.

When assessing the value of species and habitats, relevant documents and legislation are considered including the lists of species and habitat of principal importance annexed to the NERC Act (2006) and those provided within relevant local Biodiversity Action Plans. Data provided through consultation is also considered. These data sources can provide context at a local, regional and national scale.

The table below provides examples of receptors of value at different geographical scales.

TABLE 14: ECOLOGICAL RECEPTOR VALUATION	
Level of Value	Examples
International	An internationally designated site or candidate site.
	A site meeting criteria for international designation.
	The site is of functional importance* to a species population with internationally important numbers (i.e. >1% of the biogeographic population)
National	A nationally designated site.
	The site is of functional importance* to a species population with nationally important numbers (i.e. >1% of the national population)
Regional	The site is of functional importance* to a species population with regionally important numbers (i.e. >1% of the regional population)
County	A Local Wildlife Site (LWS) or equivalent, designated at a County level
	The site is of functional importance* to a species population of county value (i.e. >1% of the county population)
District	A Local Wildlife Site (LWS) or equivalent, designated at a District level
	The site is of functional importance* to a species population of district value (i.e. >1% of the district population)
Parish	A species population considered to appreciably enrich the nature conservation resource within the context of the parish.
	Local Nature Reserves
Local	A species population that contributes to local biodiversity but are not exceptional in the context of the parish.
Low	Habitats that are unexceptional and common to the local area.
* Functional importance defined as 'a feature which, based on professional judgement, is of importance to the day to day functioning of the population, the loss of which would have a detectable adverse effect on that population'.	

28 Chartered Institute for Ecology and Environmental Management (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater and Coastal

E. RESULTS

E.1 DESKTOP STUDY

E.1.1 PRE-EXISTING INFORMATION

ORDNANCE SURVEY MAPPING AND AERIAL PHOTOGRAPHY

The figures in Sections B and D show that the general land use in the surrounding area is a mix of arable and pasture land with a small number of buildings, farm steads, and woodland blocks. Woodland lines the River Tweed which passes through the site. The village of Horncliffe is located approximately 1km to the south west.

The most recent aerial photograph of the site (Section D, 2007) indicates that habitats on site are dominated by the River Tweed and the Union Chain Bridge itself. Woodland is present to the west and east and runs alongside the River Tweed. Historic imagery suggests that the site is unchanged since 2002 and the bridge is known to be 200 years old.

MAGIC WEBSITE²⁹

The table below details the internationally and nationally statutorily designated sites within 2km of the survey area.

TABLE 15: DESIGNATED SITES			
Designation	Site Name	Brief Reason for Designation	Distance from Survey Area
Special Area of Conservation	River Tweed	The Tweed represents sub-type 2 in the north-eastern part of its range. It is the most species-rich example, by far, of a river with <i>Ranunculus</i> in Scotland, and is the only site selected for this habitat in Scotland. The river has a high ecological diversity which reflects the mixed geology of the catchment. Stream water-crowfoot <i>Ranunculus penicillatus</i> ssp. <i>pseudofluitans</i> , a species of southern rivers and streams, here occurs at its most northerly location as does fan-leaved water-crowfoot <i>R. circinatus</i> , along with river water-crowfoot <i>R. fluitans</i> , common water-crowfoot <i>R. aquatilis</i> , pond water-crowfoot <i>R. peltatus</i> and a range of hybrids. The Tweed is also the most northerly site for flowering-rush <i>Butomus umbellatus</i> . Otter and salmon are also listed and primary reasons for citation. ³⁰	Within the site
Site of Special Scientific Interest	Tweed Catchment Rivers - England: Lower Tweed And Whiteadder	The site is of international importance for its estuary, intertidal mud and sandflats and its riverine floating vegetation communities often dominated by water-crowfoot <i>Ranunculus</i> species. It also supports internationally important populations of river lamprey <i>Lampetra fluviatilis</i> , sea lamprey <i>Petromyzon marinus</i> , Atlantic salmon <i>Salmo salar</i> and common otter <i>Lutra lutra</i> .	Within the site
	River Tweed (Scotland)	As above	Within the site

Given the site's location within the River Tweed SAC and associated SSSI, in the absence of appropriate mitigation, there is the potential for proposed activities to affect this protected sites. As such a report to inform an appropriate assessment has been produced separately.

²⁹ MAGIC Website: www.magic.gov.uk

³⁰ <http://jncc.defra.gov.uk/ProtectedSites/SACselection/sac.asp?EUcode=UK0012691>

PREVIOUS SURVEY

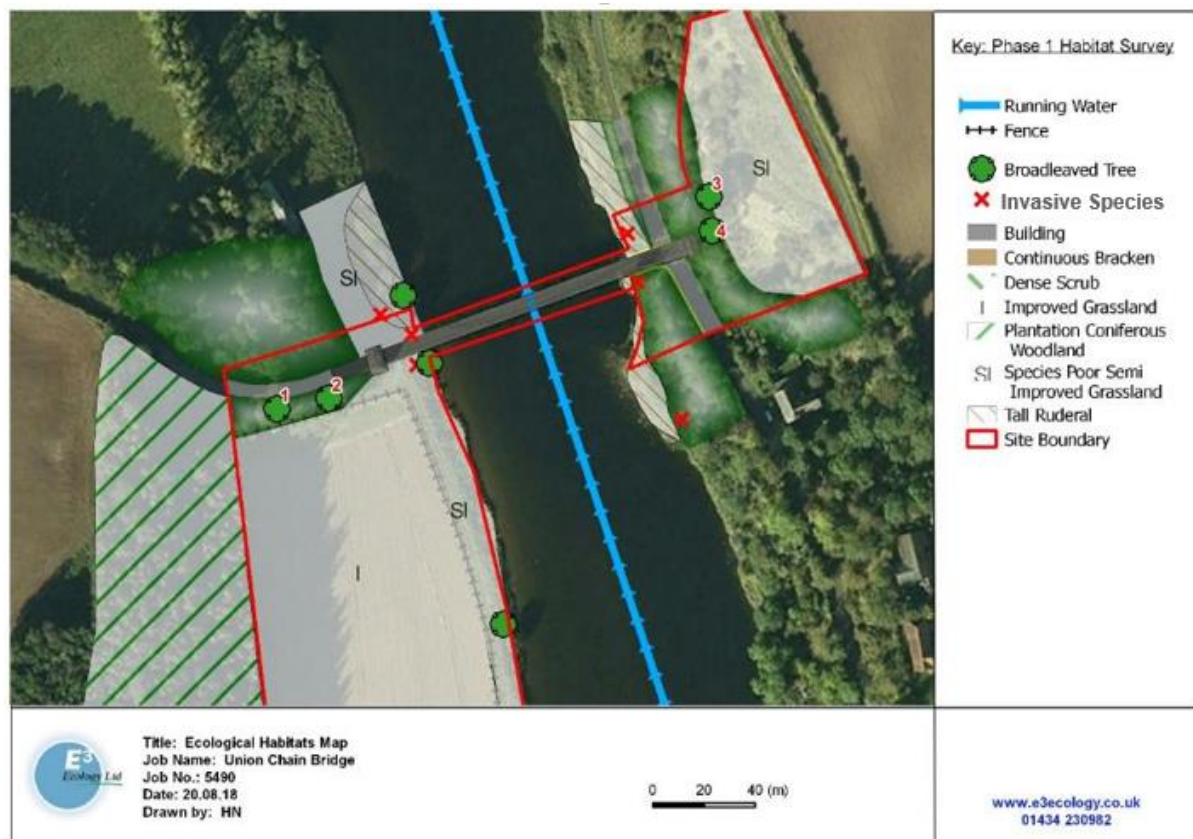
Extended phase 1 survey of the site was undertaken by Total Ecology in May 2017. Details of this survey can be found within the separate report: *Union Chain Bridge Extended Phase I Survey, Total Ecology, June 2017.*

E.2 FIELD SURVEY

E.2.1 HABITATS

Habitats within the site are dominated by the built structures of the bridge itself and the River Tweed. The left bank (Scottish) of the bridge comprises a pasture field bordered by plantation conifer woodland. To the north of this section of the bridge comprises broadleaved woodland. The banks of the tweed comprises a mix of species poor semi-improved grassland and tall ruderal vegetation. The right bank (English) of the bridge comprises a mix of broadleaved woodland and tall ruderal vegetation, whilst above the mason tower, which is set into the bank, is species poor semi-improved grassland.

The habitats present within the survey area are illustrated within the figure below and described in more detail below.



IMPROVED GRASSLAND

The field to the south west of the survey area comprises a pasture field supporting cattle at the time of survey. Sward height measures approximately 5cm with forb cover accounting for less than 5%. Species recorded include Perennial rye grass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*), meadow grass (*Poa* sp.), cocks foot (*Dactylis glomerata*), creeping buttercup (*Ranunculus repens*), nettle (*Urtica dioica*), and cleavers (*Galium aparine*).



WOODLAND AND TREES

Plantation conifer woodland is present to the south west of the survey area. This is predominantly made up of early mature spruce with scattered elder (*Sambucus nigra*) and wych elm (*Ulmus glabra*) around the eastern edge.

Broadleaf woodland is present to the north west, and eastern side the survey area. The woodland to the north west of the site comprises early and semi mature specimens of cherry (*Prunus avium*), elder, elm, hawthorn (*Crataegus monogyna*), beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*), and ash (*Fraxinus excelsior*). The understorey is sparsely vegetated with scattered nettle, herb Robert (*Geranium robertianum*), male fern (*Dryopteris filix-mas*), bramble (*Rubus fruticosus*), broad-leaved dock (*Rumex obtusifolius*).



To the north of the bridge on the eastern side is a small copse of trees with surrounding scrub which continues up the bank around the tower. This is dominated by hawthorn, silver birch (*Betula pendula*) and elder vegetation with dog rose (*Rosa canina*), cherry and ash. Two mature trees (trees 3 and 4) are located at the top of the slope to adjacent to the north east of the tower. To the south of this, species composition is similar but with more mature specimens and the addition of conifer species. Japanese knotweed, listed as invasive on schedule 9 of the Wildlife and Countryside Act 1981 was also recorded in this area.



TALL RUDERAL

The banks of the river support tall ruderal vegetation dominated by hogweed (*Heracleum sphondylium*), rosebay willowherb (*Chamerion angustifolium*), hedge woundwort (*Stachys sylvatica*), butterbur (*Petasites hybridus*), and Himalayan balsam (*Impatiens glandulifera*), a species listed as invasive on Schedule 9 of the Wildlife and Countryside Act 1981. This habitat grades into semi-improved grassland, described below.



SPECIES POOR SEMI-IMPROVED

Bank side vegetation comprises species poor semi-improved grassland. This is unmanaged along the eastern bank of the Tweed but occasionally grazed along the south western bank. Species recorded include nettle, broadleaved dock, Yorkshire fog, creeping buttercup, creeping cinquefoil (*Potentilla reptans*), cleavers, bramble, daisy (*Bellis perennis*), hogweed, common sorrel (*Rumex acetosa*), ribwort plantain (*Plantago lanceolata*), cow parsley (*Anthriscus sylvestris*), and chickweed (*Stellaria media*).



To the east of the survey area above the English bridge tower is small grassland field with similar species composition as above but unmanaged with some areas turning rank.



RIVER TWEED

The River Tweed flows through the survey area and measures approximately 80m across at this point. Flow is smooth with relatively steep banks to the east and shallow gently sloping banks to the west. Substrate is predominantly a mix of silt and gravel with some patches of cobbles and pebbles. Beds of vegetation were recorded within the flow along the right side of the river extending through the survey area. These were dominated by *Potamogeton* sp. and *Elodea* sp. but with a small quantity of crowfoot (*Ranunculus* sp.)



E.2.2 SPECIES (EXCLUDING BATS)

GREAT CRESTED NEWT

No ponds are known from within the survey area or from Ordnance Survey maps and aerial imagery from the surrounding 500m. Some suitable terrestrial habitat for this species is present within the site however given the lack of suitable breeding opportunities within the surrounding area, this species is considered unlikely to be present.

BIRDS

The trees and scrub surrounding the bridge will offer nesting and foraging opportunities for a range of bird species. The bridge towers are also used by nesting birds, predominantly pigeon which were observed during the survey. No evidence of kingfisher was recorded during the survey and the banks around the bridge are suboptimal for nesting kingfisher. The species is likely to be present along the river however, and may forage within the survey area.

BADGER

Badger survey recorded no setts within the survey area however one well used latrine was recorded within the woodland above the eastern mason tower. Snuffle holes and mammal trails, attributed to badger, were also recorded in a number of locations within the woodland and field to the east of the site, and within the conifer woodland to the west. The woodland riparian habitat surrounding the bridge will provide good quality foraging habitat for badger as well as potential sett creation opportunities. Survey results indicate that this species forages within the site on a regular basis with a sett located within the surrounding area.



OTTER

Detailed survey of the river banks recorded no evidence of otter activity. Overhanging and woodland vegetation on the eastern side of the river will provide good potential opportunities for laying up areas or holt creation with vegetation providing good shelter and potential runs. The western river bank is more exposed and less likely to be used. It is likely that otter will forage within the river and commute through the survey area on occasion.

WATER VOLE

No evidence of water vole was recorded during the survey although the river will provide potential habitat for this species.

REPTILES

The site has the potential to offer some suitable habitat for reptile species, particularly associated with the areas of coarser grassland to the east of the English tower.

RED SQUIRREL

No dreys were recorded within any of the trees in the survey area during the initial walkover or the detailed survey in August 2018. Woodland within the site will provide good quality potential habitat to this species.

WHITE-CLAWED CRAYFISH

White clawed crayfish are not known to be present along the River Tweed however habitats will provide some potential habitat to the species.

PRIORITY BUTTERFLIES

No key larval food plants for priority butterflies were recorded within the site. The survey was undertaken in optimal conditions and time of year for butterflies however none with conservation status of note were recorded. Given the habitats within the survey area, breeding populations of priority invertebrates are considered unlikely.

NATIONAL PRIORITY AND LOCAL BAP SPECIES (EXCLUDING SPECIES GROUPS LISTED ABOVE)

Hedgehog and common toad, both national priority species, are likely to be present within the site.

OTHER SPECIES

The SAC and SSSI both list Atlantic salmon within their reasons for designation. Sea and river lamprey are also listed within the SSSI citation. Detailed survey was not undertaken for these species however based on the substrate within the areas of bank that were surveyed, the section of the River within the site has the potential to be used as a breeding site. Given that these species are known to be present along the river they are likely to migrate through the site.

E.3 DAYTIME RISK ASSESSMENT (BATS)

E.3.1 HABITATS

FORAGING HABITATS

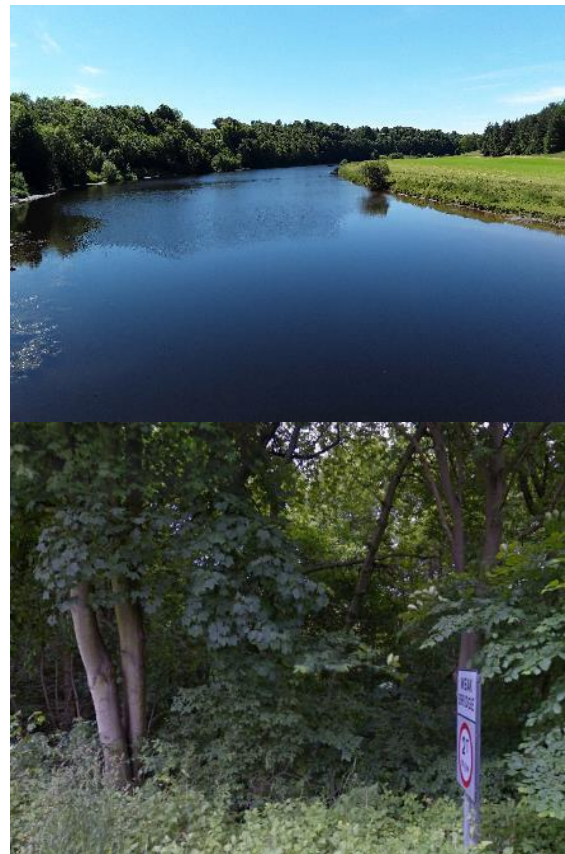
The riparian habitats and adjacent woodland will provide excellent foraging opportunities to a range of bat species.

COMMUTING ROUTES

The River Tweed will provide a strong commuting link to the wider area, as will adjacent trees lines and hedgerows within the wider area.

SHELTERED FLIGHT AREAS

The adjacent woodland and the area beneath the bridge will provide some sheltered areas for foraging during poor weather conditions.



ALTERNATIVE ROOST LOCATIONS

The small number of buildings located in the immediate surroundings are likely to provide roosting locations as will mature trees.



E.3.2 BUILDINGS

The following text provides building descriptions and the location of each structure is illustrated within the figure below. Where recorded, field signs that confirm bat use are in bold.

Right bank (English side) bridge tower:

- The mason bridge towers measures approximately 10m high and is of cut stone construction.
- The tower is set into the adjacent bank with multiple gaps between cliff and tower. The majority of these appear to either be shallow or have filled with soil and vegetation. A small number are deeper and extend back into the cliff face.
- The majority of the mortar within tower is in good condition with few gaps, those that were noted appear shallow.
- Six large square openings are present at the top which lead into, what appears to be, a small void into which the bridge suspension chains enter into the mason tower. Some netting is evident within these openings having previously been installed to deter nesting birds, however some has come away and pigeons were observed at these locations.
- A decorative masonry ledge is present approximately 1.5m from the top with some possible associated gaps.
- Vegetation is growing close to tower and comprises young woodland and scrub. A small quantity of climbing scrubs and grasses have begun to



colonise some of the stone work and multiple trees overhang.

- The top of the tower is flat with a small hatch leading into a small loft void. Large quantities of bird droppings and old nesting material was evident within the void.
- Overall considered to be of moderate suitability.



Left bank (Scottish side) bridge tower:

- Same construction style as English tower but free standing instead of set into a cliff.
- Similar condition with cut stone and mortar in general good condition with few noted gaps, most associated with the top of the structure.
- Twelve square openings, six on each side of the tower, are present where suspension chains enter the tower. As with the English tower, some netting has been installed to deter nesting birds, however evidence of continued use by nesting pigeons is still clear.
- Overall considered to be of moderate suitability.



Bridge:

The central bridge structure comprises overlapping timber boards with tarmac overlaid. Areas that could be seen all appeared tightly sealed however the whole structure could not be inspected due to flowing water underneath. As such the bridge is considered to be of low suitability.





FIGURE 5: BUILDING LOCATIONS
(Reproduced under licence from Google Earth Pro.)

E.3.3 TREES

Trees were inspected and assessed for their potential to support roosting bats and were categorised against the index of suitability as detailed within Section D.3.5. The table below provides information relating to each tree and the relevant category of suitability. Photographs are provided below and tree locations are illustrated within the figure below.

TREE 1

Mature beech tree with double leader. Ivy (*Hedera helix*) is developing up the main stem but is not as yet at a sufficient density to provide a potential roosting feature (PRF). A small number of PRFs were noted from the ground including knot holes and a small amount of aerial deadwood. Aerial inspection found all features to be occluded with no suitable crevices for roosting bats. Overall the tree is considered to be of low suitability.



TREE 2

Mature beech tree with double leader that starting to occlude each other in multiple places. This has created a sheltered area between the two stems but is light and exposed. A knot hole is present at approximately 6m high on eastern side of main stem, this is damp but large enough for a single bat. Other features within the trees all lack cavities suitable for roosting bats. Overall the tree is considered to be of low suitability.



TREE 3

A mature ash tree with developing ivy cover. A single knot hole was noted at approximately 3.5m on the south side of the main stem but appeared occluded. No other features were noted however full aerial inspection was not possible due to the presence of a live overhead wire in close proximity to the tree. Overall the tree is considered to be of low suitability.



TREE 4

A mature sycamore with developing ivy, not yet at a density that is likely to form PRFs but may obscure the detection of other features. No other features were recorded however aerial inspection was not possible due to the presence of a live overhead wire in close proximity to the tree. Overall the tree is considered to be of low suitability.





FIGURE 6: TREE LOCATIONS
(Reproduced under licence from Google Earth Pro.)

Other trees within the survey area were considered to be of low or negligible suitability for roosting bats.

E.4 OVERVIEW OF SITE SUITABILITY

The table below provides an overview of site suitability in relation to bats.

TABLE 16: OVERVIEW OF SITE SUITABILITY FOR BATS				
HABITATS AND SETTING ³¹				
	NEGLEGIBLE	LOW	MODERATE	HIGH
HABITATS AND COVER WITHIN 200M	City Centre	Open, exposed arable, amenity grass or pasture	Hedges and trees linking site to wider countryside	Excellent cover with mature trees and/or good hedges
HABITATS WITHIN 1KM	City Centre	Little tree cover, few hedges, arable dominated	Semi-natural habitats e.g. trees, hedgerows	Good network of woods, wetland and hedges
ALTERNATIVE ROOSTS WITHIN 1KM	City centre	Numerous alternative roost sites of a similar nature	A number of buildings in the local area	Few alternative buildings and site of good quality for roosts
SETTING	Inner city	Urban with little green space	Built development with green-space, wetland, trees	Rural Lowland with woodland and trees.
DISTANCE TO WATER/ MARSH	>1km	500m-1000m	200m-500m	<200m
DISTANCE TO WOODLAND/ SCRUB	>1km	500m-1000m	200m-500m	<200m

³¹ Building and habitat risk assessment technique audited in a research project with York University which compared the risk assessment scoring with the results of detailed field assessment for over 100 sites. Statistically significant associations were found between habitat setting and building features and the presence of absence of different bat species. For example habitat connections and nearby woodland were significant for brown long-eared bats and the presence of species-rich grassland is important for many species.

TABLE 16: OVERVIEW OF SITE SUITABILITY FOR BATS				
DISTANCE TO SPECIES-RICH GRASSLAND	>1km	500m-1000m	200m-500m	<200m
COMMUTING ROUTES	Isolated by development, major roads, large scale agriculture	No potential flyways linking site to wider countryside	Some potential commuting routes to and from site	Site is well connected to surrounding area with multiple flyways
BUILDINGS ²				
	MINIMAL	LOW	MEDIUM	HIGH
AGE (APPROX.)	Modern	Post 1940s	1900-1940	Pre 20 th C
BUILDING/ COMPLEX TYPE	Industrial complex of modern design	Single, small building	Several buildings, large old single structure	Traditional farm buildings, country house, hospital
BUILDING - STOREYS	N/A	Single storey	Multiple storeys	Multiple storeys with large roof voids
STONE/BRICK WORK	No detectable crevices	Well pointed	Some cracks and crevices	Poor condition, many crevices, thick walls
ROOF VOID	Fully sealed or flat roof	Small, cluttered void	Medium, relatively open	Large, open, interconnected
ROOF COVERING	Modern sheet materials and tightly sealed	Good condition or very open not weatherproof modern sheet materials	Some potential access routes, slates, tiles	Uneven with gaps, not too open, stone slates
ADDITIONAL FEATURES	Very well maintained and tightly sealed	No features with potential access	Some features with potential access	Hanging tiles, cladding, barge boards, soffits with access gaps
EXTERNAL LIGHTING	Extensive security lights covering much of the site	Widespread areas above 2 lux at night	Intermittent lights of low intensity	Minimal
BUILDING USE	Very noisy, dusty	Regular use	Intermittent use	Disused

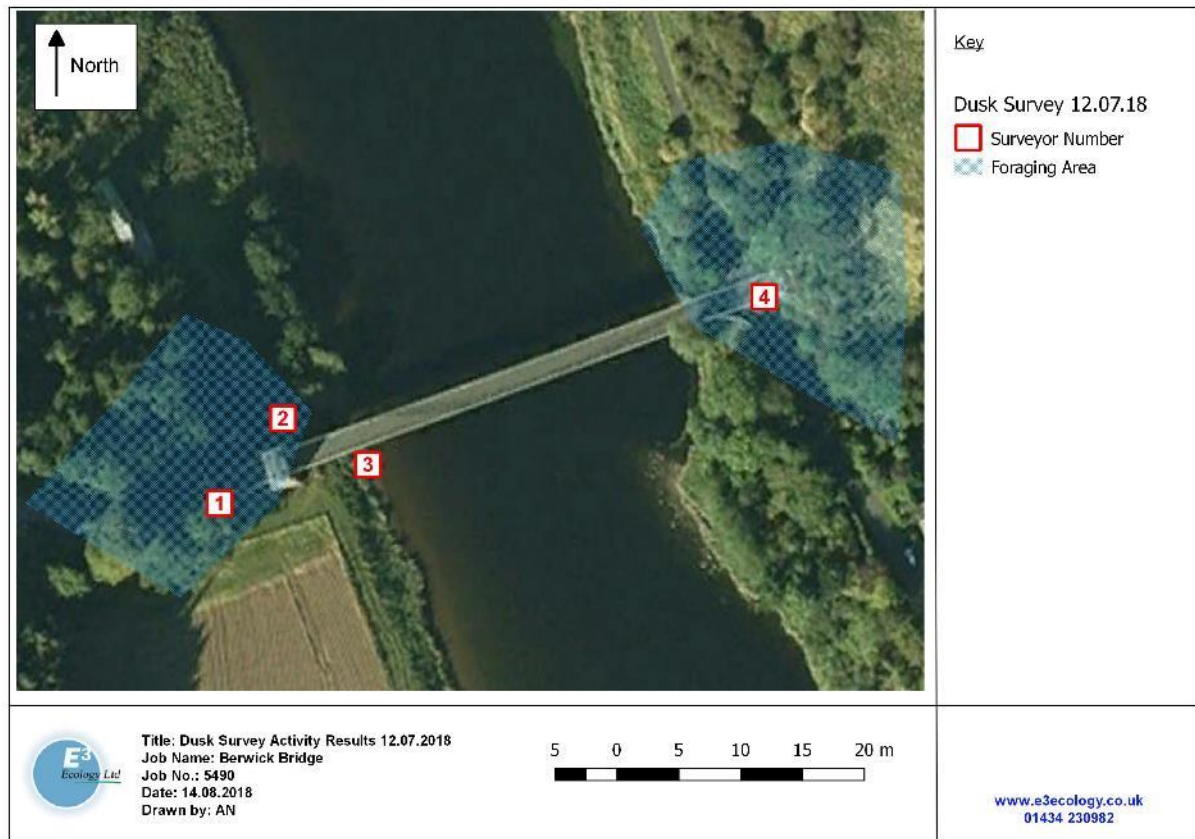
As illustrated in the table above the bridge is of moderate suitability for bats, located within high suitability habitat.

E.5 ACTIVITY SURVEY

E.5.1 DUSK EMERGENCE/DAWN SWARMING ACTIVITY SURVEY

12th July 2018 Dusk Survey

Dusk survey was undertaken in mid-July, in warm and calm conditions. First recorded activity was of 3-4 soprano pipistrelles commuting from the south east of the site towards the north, with foraging activity noted up and down the wooded lane leading to the bridge from this direction. Timings (20 mins after sunset/ lux 81) would suggest a nearby roost. Bat activity during the survey was predominantly attributed to soprano pipistrelle however a small number of passes from common pipistrelle, noctule and Nathusius' pipistrelle were also recorded, all more than an hour after sunset. Bats were recorded foraging around trees and over the River Tweed, throughout the survey. *Myotis* sp. foraging activity was also recorded around the Scottish tower approximately an hour and 20 minutes after sunset. No roosts were recorded.



2nd August 2018 Dawn Survey

Dawn survey undertaken in August also recorded no roosts within any of the bridge structures. Moderate levels of *Myotis* sp. foraging activity was again recorded foraging around the Scottish tower until approximately an hour prior to sunrise. As with the dusk survey, the majority of bat activity was attributed to soprano pipistrelle with a single noctule pass. The last recorded bat was approximately half an hour before sunrise and was of soprano pipistrelle foraging along the lane south east of the bridge.

Key survey data are provided in Appendix. The figure below provides a summary of the results of dusk emergence/dawn swarming surveys.



FIGURE 7: SUMMARY OF DUSK EMERGENCE/DAWN SWARMING SURVEY RESULTS
 (Reproduced under licence from Google Earth Pro.)

F. SITE ASSESSMENT

F.1 HABITATS

Habitats within the site are dominated by hardstanding, improved grassland and species more semi-improved grassland considered to be of low habitat value. Riparian habitats and woodland are considered to be of at least parish value however are part of a larger network of habitats protected at both national and international level and as a whole, are of much higher value.

Himalayan balsam and Japanese Knotweed, both listed as invasive on schedule 9 of the Wildlife and Countryside Act 1981, were recorded within the survey area. Giant hogweed and montbretia, also listed as invasive, were recorded during survey carried out by Total Ecology in 2017 however no evidence of either species was recorded during updating survey undertaken into inform this report.

F.2 NOTABLE SPECIES (EXCLUDING BATS)

The woodland within the survey area will provide nesting opportunities to breeding birds, as will the bridge structures, particularly within the mason towers. Riparian habitats will provide good quality habitat to a range of bird species and is likely to be of at least parish value.

No badger setts were recorded within the site during survey work carried out in 2018 or by Total Ecology in 2017. Field signs were recorded during both years however, including a well-used latrine within the woodland above the English bridge tower. Habitats will provide good quality foraging opportunities to this species and is likely to be of at least local value.

Otter are known to be present along the River Tweed and are a primary reason for citation within the SAC and SSSI^{32, 32} of the same name. Otter survey of the river banks recorded no evidence of the species although the habitats on the eastern river bank are well suited for holt creation and otter are likely to forage and commute within the river. Habitats within the survey area are typical of the habitats along this section of the river, and are considered to be of local value to the species, however are part of a larger network of habitats of significantly higher value.

No evidence of red squirrel was recorded during the initial survey or subsequent protected species surveys. Habitats within the site will provide good quality potential habitat to this species and, should they be present, is likely to be of local value.

Water vole are known to be present within small isolated populations along the River Tweed, as noted within the SSSI citation^{31,33}. Habitats along river banks, in particular the eastern bank, will provide suitable habitat for these species, although no field sign or burrows were noted during the watercourse survey. Should they be present, the site is likely to be of up to parish value.

Atlantic salmon, sea and river lamprey are known to be present within the River Tweed. Detailed survey has not undertaken for these species however the section of the River within the site is likely to provide good habitats for these species. Given that these species are known to be present along the Tweed and will migrate through the site, with the additional potential for breeding use, the site will form part of a network of habitats of significant value to these species. It is recommended that further survey of the river bed within the proposed working area is undertaken to fully assess the value of the site for these species.

³²<http://jncc.defra.gov.uk/ProtectedSites/SACselection/sac.asp?EUcode=UK0012691>

³³ <https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/2000288.pdf>

Habitats within the site will offer some limited suitable areas for reptiles. The areas of hard standing and short grassed improved grassland will be no more than low value whilst semi-improved grassland is likely to be of local value, should the species be present.

The national priority species hedgehog is likely to be within the survey area and surrounding habitats which will be of up to local value for the species.

Other protected or otherwise notable species are considered unlikely to be present due to the lack of suitable habitats within the site or surrounding area.

F.3 ASSESSMENT OF SURVEY FINDINGS (BATS)

Dusk and dawn survey of the bridge structures recorded no evidence of roosting bats. Bat activity was dominated by soprano pipistrelles but with a small number of passes from common pipistrelle, noctule and Nathusius pipistrelle. *Myotis* sp. foraging activity was also recorded around the woodland to the west of the Scottish tower. Overall habitats surrounding the site are considered to be of local value to bats but part of a network of habitats likely to be of much high value.

F.4 POPULATION SIZE CLASS ASSESSMENT (BATS)

There remains a low residual risk that the buildings are used by small numbers of bats, at intervals through the year. The buildings are likely to be used, if at all, as an occasional summer non-breeding day roost site and perhaps a hibernation site.

F.5 LIMITATIONS AND CONSTRAINTS

Survey completed at the site will provide reasonably typical data for the summer period. Assessment of the bat use of the site at other times of year and the potential impacts of the proposed development is based on professional judgement. This is an approach supported by the Bat Conservation Trust Good Practice Guidelines³⁴ where it is stated that 'If a site has very little or no potential for bats, this should be explained in the preliminary ecological appraisal and no further surveys should be proposed'.

³⁴ Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust

G. IMPACT ASSESSMENT

The likely effects of the proposed development, without appropriate targeted mitigation and/or compensation, are detailed below.

G.1 POTENTIAL IMPACTS AND/OR EFFECTS³⁵

G.1.1 HABITATS

- Loss of a small number of mature and semi-mature trees located around the mason towers.
- Risk of damage to roots and crowns of retained trees.
- Risk of pollution of the River Tweed from run-off or debris during restoration works.
- Temporary damage to improved and semi-improved grassland through use as site compounds during works.
- Risk of the spread of invasive species including Japanese knotweed, Himalayan balsam, giant hogweed, and montbretia during the works.
- Temporary increased light spill during the restoration works.

G.1.2 SPECIES

- Low residual risk of harm or disturbance to bats.
- Loss of a small number of potential roost sites associated with the bridge through re-pointing works and exclusion measures for nesting birds.
- Risk of disturbance to migratory or breeding salmon and lamprey
- Risk of disturbance to foraging and commuting otter. Risk of disturbance to otter should a holt or resting place become established prior to the start of works.
- Disturbance to badger during works, risk of disturbance or damage to a badger sett should one be established prior to the start of works.
- Risk of harm to mammals through entrapment in works trenches, during the works.
- Harm or disturbance to red squirrel should a drey become established prior to the start of works.
- Harm and/or disturbance to nesting birds should any vegetation clearance be carried out during the breeding bird season (March to August inclusive).
- Low risk of harm and/or disturbance to water vole.
- Low risk of harm to reptiles.

G.2 POTENTIAL IMPACTS AND/OR EFFECTS ON STATUTORY AND NON STATUTORY SITES DESIGNATED FOR NATURE CONSERVATION

Works have the potential to impact of habitats and species cited within the SAC and SSSI. A report to inform the relevant Appropriate Assessment and Habitat Regulations Assessment will therefore be produced.

³⁵ An impact is defined as an action resulting in changes to an ecological feature. For example, construction works removing a hedgerow. An effect is defined as the outcome to an ecological feature from an impact. For example, the effect on a dormouse population of the loss of a hedgerow.

H. RECOMMENDATIONS

Mitigation strategy will be finalised following further survey work, detailed below. The mitigation strategy aims to minimise effects on biodiversity by:

- avoiding significant negative impacts where possible through good design; and
- developing approaches to mitigate any remaining unavoidable impacts.

Where any significant residual impacts on biodiversity are anticipated, compensation may then be proposed. This approach is in-line with CIEEM recommendations³⁶.

H.1 FURTHER SURVEY

Further survey of the river bed within the working area is required in order to assess potential impacts on key fish species.

Pre-commencement checks for badger setts, red squirrel, otter and water vole will be undertaken one month prior to the start of works.

H.2 AVOIDANCE AND MITIGATION STRATEGY

Mitigation strategy to address potential impacts on key fish species will be produced following further required survey work.

H.2.1 SITE DESIGN

- Additional external lighting that may reduce bat use of potential roost sites (retained and/or new) will be avoided. Light spillage onto adjacent habitats during the refurbishment work will be restricted.

H.2.2 TIMING OF WORKS

- Vegetation clearance/tree felling will be undertaken outside of the bird nesting season (March to August inclusive) unless a checking survey by a suitably experienced ornithologist confirms the absence of active nests. A check for kingfisher will also be carried out pre-commencement of works.
- Prior to works commencing a site induction meeting will be held, attended by the project ecologist and lead contractors.
- Works will not commence until a detailed inspection of the structure has taken place once scaffolding/cherry picker access has been provided.

H.2.3 WORKING METHODS AND BEST PRACTICE

- Any excavations left open overnight will have a means of escape for mammals that may become trapped in the form of a ramp at least 300mm in width and angled no greater than 45°.
- The roots and crowns of retained trees will be protected throughout the development through the provision of adequate construction exclusion zones in accordance with the guidance given by BS5837:2012.
- Works onsite will follow detailed method statements relating to bats, otter, invasive species, cited fish species, and reptiles, as detailed within the Construction Environment Management Plan (CEMP) produced separately. This will be provided to contractors prior to the induction process at the start of works. The project ecologist will review all key points with contractors during the induction and provide all necessary training. An

³⁶ Chartered Institute for Ecology and Environmental Management (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater and Coastal

Ecological clerk of works will also be consulted during works and be present onsite as required.

- If bats are found during works, works will stop in that area and the ecological consultant will be contacted immediately. If it is necessary to move the bats for their safety, this will be undertaken by a licensed bat handler.
- Best practice methods will be followed to ensure that no contamination or pollution of the River Tweed occurs from works.
- Trees 3 and 4, will be inspected by aerial climbers prior to felling to ensure that no features unseen from the ground are present.

The following measures should be included as general good working practice:

- If required, timber treatments that are toxic to mammals will be avoided. If required, timber treatment will be carried out in the spring or autumn. Both pre-treated timbers and timber treatments will use chemicals classed as safe for use where bats may be present (see http://www.jncc.gov.uk/pdf/batwork_manualpt4.pdf).

H.3 COMPENSATION STRATEGY

The following compensation strategy is proposed:

H.3.1.1 BAT BOXES

In advance of the start of works 6 bat boxes will be erected in adjacent trees, within the site to provide alternative roost sites. Boxes will be erected as high as possible, ideally at a minimum height of 4m.

Boxes will include 1 suitable for use by breeding bats 4 crevice boxes, and 1 suitable for hibernation use by small numbers of bats.

H.4 MONITORING

Given the nature of the proposed mitigation and/or compensation strategies, no monitoring is proposed.

H.5 ADDITIONAL ENHANCEMENT RECOMMENDATIONS

The following additional enhancement measures are recommended in order to further enhance the site for biodiversity:

- Some of the timber and refuse from tree and vegetation clearance around the towers will be piled in adjacent woodland to form habitat piles of benefit to range of species including hedgehog.

APPENDIX 1. STATUTORILY AND NON- STATUTORILY DESIGNATED SITES

STATUTORILY DESIGNATED SITES

Ramsar Sites

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. The Convention recognizes wetlands as important ecosystems and includes a range of wetland types from marsh to both fresh and salt water habitats. The wetlands can also include additional areas adjacent to the main water-bodies such as river banks or coastal areas where appropriate.

Special Protection Areas (SPAs)

SPAs are classified by the UK Government under the EC Birds Directive and comprise areas which are important for both rare and migratory birds.

Special Areas of Conservation

SACs are designated under the EC Habitats Directive and are areas which have been identified as best representing the range and variety of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the Conservation of Habitats and Species Regulations 2017 (as amended) unless they are offshore.

Sites of Special Scientific Interest

SSSIs are designated as sites which are examples of important flora, fauna, or geological or physiographical features. They are notified under the Wildlife and Countryside Act 1981 with improved provisions introduced by the Countryside and Rights of Way Act 2000. They are often components of larger SACs or SPAs.

National Nature Reserves (NNRs)

NNRs are designated by Natural England under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 and support important ecosystems which are managed for conservation. They may also provide important opportunities for recreation and scientific study.

Country Parks

Country Parks are statutorily designated and managed by local authorities in England and Wales under the Countryside Act 1968. They do not necessarily have any nature conservation importance, but provide opportunities for recreation and leisure near urban areas.

NON-STATUTORILY DESIGNATED SITES

Local Nature Reserves (LNRs)

LNRs are designated under the National Parks and Access to the Countryside Act 1949 by local authorities in consultation with Natural England. They are managed for nature conservation and used as a recreational and educational resource.

Non-Governmental Organisation Property

These are sites of biodiversity importance which are managed as reserves by a range of NGOs. Examples include sites owned by the RSPB, the Woodland Trust and the Wildlife Trusts

Local Wildlife Sites (LWSs)

These are sites defined within the local plans under the Town and Country Planning system and are material considerations of any planning application determination. They are designated by the local authority although criteria can vary between authorities.

APPENDIX 2. BAT ECOLOGY

BAT LIFECYCLE

Bat survey timings are based on the lifecycle of bats which varies through the calendar year. The table below illustrates recommended survey timings and how they relate to the bat lifecycle:

BAT LIFECYCLE AS IT RELATES TO SURVEY TIMING ³⁷												
SURVEY TYPE	J	F	M	A	M	J	J	A	S	O	N	D
Roost Inspection												
Mating/Swarming Survey												
Hibernation Survey												
Tree survey from the ground												
Tree roost activity survey												
Building roost activity survey												
Dark grey are optimal timings, light grey suboptimal.												
BAT ROOST USE THROUGH THE YEAR												
Day Roost												
Night Roost												
Feeding Roost												
Transitional/Occasional Roost												
Swarming Site												
Mating Site												
Maternity Roost												
Hibernation Roost												
Satellite Roost												

³⁷ Based on information provided within Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust

BAT ROOST TYPES

Bat Roost Types	
Roost Type	Definition
Day Roost	A place where individual bats or small groups of males, rest or shelter in the day but are rarely found by night in the summer.
Night Roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or could be used regularly by the whole colony.
Feeding Roost	A place where individual bats or a few individuals rest or feed during the night but are rarely present by day.
Transitional/Occasional Roost	Used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.
Swarming Site	Where large numbers of males and females gather during late summer to autumn. Appear to be important mating sites.
Mating Site	Sites where mating takes place from late summer and can continue through winter.
Maternity Roost	Where female bats give birth and raise their young to independence. Females typically give birth to a single pup per year, therefore these roosts are critical to the long-term survival of a colony. Disturbance of maternity roosts can lead to abandonment and death of young.
Hibernation Roost	Where bats may be found individually or together during winter. They have a constant cool temperature and high humidity. Bats are particularly vulnerable to disturbance during the hibernation period as, once roused, they may be unable to replace energy lost due to a lack of sufficient available insect prey at this time.
Satellite Roost	An alternative roost found in close proximity to the main nursery colony used by a few individual breeding females to small groups of breeding females throughout the breeding season.

SPECIES SPECIFIC ECOLOGY

Pipistrelle maternity colonies generally consist of 25 to 100 individuals, but colonies numbering up to 1000 are not uncommon³⁸. Adult females often form large maternity roosts, occupied between May and August, and frequently number around 300 individuals. Males are often solitary or in small groups during the summer, later congregating with the females at winter hibernation roosts³⁹.

Maternity colonies of brown long-eared bats are generally small, consisting of 10 to 20 adults^{40,41} (although numbers are likely to be underestimated, due to presence in inaccessible areas of the roost). In exceptional circumstances, colonies can reach 200+ bats.

Natterer's bats roost within crevices and cavities, typically within hollow trees, old buildings, caves and tunnels⁴². Maternity colonies comprising up to 200 adult females can be found in buildings during the summer months while bachelor roosts comprising up to 28 males have been recorded during the summer months in Scotland⁴³. Maternity roosts are not exclusively female, with both adult and immature males comprising up to 25% of the colony. Male only colonies have been found with up to 30 bats⁴⁴. Foraging individuals will perch during the night at roosts near to foraging areas, not used as day roosts. Mostly these roosts are trees or shrubs but barns will also be used⁴⁵.

³⁸ Roberts, G.M. & Hutson, A.M. 2000. *Pipistrelle*. British Bats No. 6. The Bat Conservation Trust, London

³⁹ Corbet, G.B & Southern, H.N., 1964. The handbook of British Mammals).

⁴⁰ Speakman, J. R. *et al.*, 1991. Minimum summer populations and densities of bats in NE Scotland, near the northern borders of their distributions. *J. Appl. Ecol.*, 225: 327-345

⁴¹ Entwistle, A.C., 1994. Roost ecology of the brown long-eared bat *Plecotus auritus* in north-east Scotland. Unpublished PhD thesis, University of Aberdeen, UK

⁴² Stebbings, R.E. 1991. Natterer's bat *Myotis nattereri*. In The handbook of British Mammals. 3rd Edition Corbet, G.B. & Harris, S. (Eds) Oxford: Blackwell Scientific.

⁴³ Swift, S. M. 1997 Roosting and foraging behaviour of Natterer's bats (*Myotis Nattereri*) close to the northern border of their distribution. *J. Zool. (Lond)* **242**: 375-384.

⁴⁴ Altringham, J.D. 2003. British Bats. The New Naturalist. Pub. Harper Collins.

⁴⁵ Smith, P.G. & Racey, P.A. 2005. The itinerant Natterer: physical and thermal characteristics of summer roosts of *Myotis nattereri* (Mammalia: Chiroptera) *J. Zool. Lond.* 266: 171-180.

Whiskered bats roost in trees and buildings. Nursery roosts can number over 100 bats, and are almost exclusively female bats. This species hibernates singly in caves, hanging on the open wall or in crevices⁴⁴.

Brandt's bat is thought to have similar roosting behaviour and foraging ecology to the whiskered bat, however, further research is needed to clarify this⁴⁴.

A third small *Myotis* species, the Alcathoe's bat has recently been confirmed within the UK.

APPENDIX 3. BATS AND DEVELOPMENT

A list of development types likely to affect bats where they impact on particular features is provided within the table below.

PLANNING AND DEVELOPMENT TRIGGER LIST FOR BAT SURVEYS ⁴⁶	
NATURE OF WORK	TYPE OF BUILDING OR FEATURE
Conversion, modification, demolition or removal of buildings (including hotels, schools, hospitals, churches, commercial premises and derelict buildings)	Agricultural buildings e.g. farmhouses, barns and outbuildings) of traditional brick or stone construction and/or with exposed wooden beams
	Buildings with weather boarding and/or hanging tiles that are within 200m of woodland and/or water
	Pre-1960 detached buildings and structures within 200m of woodland and/or water
	Pre-1914 buildings within 400m of woodland and/or water
	Pre-1914 buildings with gable ends or slate roofs, regardless of location
	Buildings located within, or immediately adjacent to woodland and/or immediately adjacent to water
	Dutch barns or livestock buildings with a single skin roof and board and gap or Yorkshire boarding if following a preliminary roost assessment, the building appears particularly suited to bats
Any development works	Any underground duct or structure including tunnels, mines, kilns, ice houses, adits, military fortifications, air raid shelters, cellars
	Unused industrial chimneys that are lined and of brick/stone construction
Floodlighting	Churches and listed buildings, green space (e.g. sports pitches) within 50m of woodland, water, field hedgerows or lines of trees with connectivity to woodland or water
	Any building listed in reference 1
Felling, removal or lopping	Woodland
	Field hedgerows and/or lines of trees with connectivity to woodland or water bodies
	Old and veteran trees that are more than 100 years old
	Mature trees with obvious holes, cracks or cavities or which are covered with mature ivy (including dead trees)
Any development works	Within 200m of rivers, streams, canals, lakes, reedbeds or other aquatic habitats
Any development works	Within or immediately adjacent to quarries or gravel pits
	Immediately adjacent to or affecting natural cliff faces and rock outcrops with crevices or caves and sinkholes
Any single or multiple wind turbine construction	N/A – although for single turbines this can depend on size and location
Any development works	Sites where bats are known to be present

⁴⁶ Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust

A summary of the likely scale of impact at a site level in relation to various bat features and development effects is provided below.

SUMMARY OF MAIN IMPACTS AT SITE LEVEL				
Habitat Feature	Development Effect	Scale of impact		
		Low	Medium	High
Maternity Roost	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside breeding season	✓		
	Post-development interference			✓
Major Hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference			✓
Minor Hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Modified management		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference		✓	
	Temporary destruction then reinstatement	✓		
Mating	Destruction		✓	
	Isolation caused by fragmentation		✓	
	Partial destruction; modification	✓		
	Modified management	✓		
	Temporary disturbance outside hibernation season	✓		
	Post-development interference	✓		
	Temporary destruction then reinstatement	✓		
Night Roost	Destruction	✓		
	Isolation caused by fragmentation	✓		
	Partial destruction; modification	✓		
	Modified management	✓		
	Temporary disturbance outside hibernation season	✓		
	Post-development interference	✓		
	Temporary destruction then reinstatement	✓		
N.B. This is a general guide only and does not take into account species differences. Medium impacts in particular depend on the care with which any mitigation is designed and implemented and could range between high and low.				

APPENDIX 4. BATS ACTIVITY SURVEY RESULTS

Site	Berwick Bridge		Job No	5490	Date	12.07.2018	No. of Surveyors	4
Start Time	21:20	End Time	23:15	Sunset Time		21:38	No. of Remotes	0
Start Temp	17	Sunrise Temp	15	Start Cloud Cover		80	End Cloud Cover	80
Start Wind	0	End Wind	0	Start Precipitation		Nil	End Precipitation	Nil
Temperature (°C); Wind (F); Cloud Cover (%)								
Roosts								
None recorded								
First Records			Commuting			Foraging		
45	23:08		Common pipistrelle			Soprano pipistrelle		
55	22:00		Myotis					
Noc	22:51		Noctule					
Myo	23:00		Nathusius' pipistrelle					
39	22:55							
Times given below detail emergence/possible emergence & first record of each species for each surveyor								
Lux	Time	Surveyor 1	Surveyor 2	Surveyor 3	Surveyor 4			
100 +	21:20							
	21:25							
	21:30							
	21:35							
	21:40							
	21:45							
	21:50							
	21:55							
81	22:00	55 (First rec 22:04), Noc, Myo		55 (First rec 22:04)	55 (First rec 22:00), 45, Noc			
57	22:05							
36	22:10							
27	22:15							
18	22:20							
9	22:25							
5	22:30		55 (First rec 22:09)					
4	22:35							
3.3	22:40			55, Noc, 39				
2.6	22:45							
1.7	22:50							
1.4	22:55							
0.9	23:00							
0.8	23:05							
0.8	23:10							
0.5	23:15							

Sunset		Emergence		Potential Emergence		Foraging/ Commuting	
Surveyors				Bat Key			
1	Sasha Taylor			<i>Common pipistrelle</i>	45	<i>Daubenton's</i>	Da b
2	Danny Goodall			<i>Soprano pipistrelle</i>	55	<i>Noctule</i>	No c
3	Peter Grecis			<i>Nathusius' pipistrelle</i>	39	<i>Serotine</i>	Ser
4	Hannah Norman			<i>Natterer's</i>	Nat	<i>Leisler's</i>	Nat
Other Recorded Species	Heron, mole and swallow			<i>Whiskered/ Alcathe's/Brandt's</i>	WA B	<i>Brown Long Eared</i>	BL E
				<i>Unknown</i>	?	<i>Myotis</i>	My o

Site	Berwick Bridge		Job No	5490	Date	02.08.2018	No. of Surveyors	4
Start Time	03:40	End Time	05:30	Sunrise Time		05:18	No. of Remotes	0
Start Temp	13	Sunrise Temp	10	Start Cloud Cover		90	End Cloud Cover	90
Start Wind	0	End Wind	0	Start Precipitation		0	End Precipitation	0
Temperature (°C); Wind (F); Cloud Cover (%)								
Roosts								
None recorded								
Last Records			Commuting			Foraging		
55	04:46		Noctule			Soprano pipistrelle		
Noc	03:47		Myotis			Myotis		
Myo	04:11							
Times given below detail emergence/possible emergence & first record of each species for each surveyor								
Time	Surveyor 1		Surveyor 2		Surveyor 3		Surveyor 4	
03:40	55							
03:45								
03:50	55		55, Noc, Myo. (Last rec 04:40)					
03:55								
04:00								
04:05					55, Myo. (Last rec 04:44)		55, Myo. Last rec 04:46)	
04:10	Myo							
04:15								
04:20								
04:25								
04:30								
04:35	55 (Last rec 04:38)							
04:40								
04:45								
04:50								

04:55							
05:00							
05:05							
05:10							
05:15							
05:20							
05:25							
05:30							
Sunset		Emergence		Potential Emergence		Foraging/ Commuting	
Surveyors				Bat Key			
1	Dom Hall			Common pipistrelle	45	Daubenton's	Dab
2	Ken Wright			Soprano pipistrelle	55	Noctule	Noc
3	Matt Breadin			Nathusius' pipistrelle	39	Serotine	Ser
4	Hannah Norman			Natterer's	Nat	Leisler's	Nat
Other Recorded Species	None			Whiskered/ Alcatloe's/Brandt's	WAB	Brown Long Eared	BLE
				Unknown	?	Myotis	Myo