

Appendix 10 Ecology and Nature Conservation

Preliminary Ecological Appraisal (PEA) – A90 Laurencekirk, Junction Improvements

Co25000276 / PEA Rev.1

January 2018



Document Control Sheet

Project Name:	A90 Laurencekirk, Junction Improvements
Project Number:	Co25000276
Report Title:	Preliminary Ecological Appraisal
Report Number:	PEA

Issue Status/Amendment	Prepared	Reviewed	Approved
Rev 1 – for issue	Name: Lorna McRae Signature:  Date: 22/01/2018	Name: Andrew Warwick Signature:  Date: 22/01/18	Name: Lois Warnock Signature:  Date: 26/01/2018
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1 Introduction

1.1 Background

The scheme is located on the A90 trunk road at Laurencekirk, Aberdeenshire. Laurencekirk is situated approximately 40km south of Aberdeen. The A90 is the main strategic link between Dundee and Aberdeen. The three A90 at-grade junctions at Laurencekirk have had issues relating to safety and delay, and the junctions have been subject to a range of measures aimed at reducing accident frequency and severity.

Amey Consulting have been commissioned by Transport Scotland to design and construction of a new grade-separated junction at Laurencekirk. As part of this process a Preliminary Ecological Appraisal (PEA) has been carried out to consider the potential for protected species or habitats that could result in a constraint to the proposed scheme. The assessment detailed below follows guidelines produced by the Chartered Institute of Ecology and Environmental Management, CIEEM, 2013 (Ref 1). The area was surveyed by suitably qualified and experienced Amey ecologists in March 2017. This report details these initial ecological findings and makes recommendations for further targeted surveys where necessary.

1.2 Study area and location

The scheme is located in the north east of Scotland, approx. 40km south of Aberdeen, within Aberdeenshire council area (Appendix 1.1 of the Stage 2 Environmental Assessment Report (EAR)). The 'scheme' in this report is defined as the 4.7km stretch of the existing A90 between the south junction (National Grid Reference (NGR) NO70000 69872) and the north junction (NGR NO 73049 73023). The receiving environment is predominantly of arable farmland, interspersed with areas of grassland, woodland and various watercourses. Laurencekirk town is located on the west side of the A90, with various farm holdings throughout the survey area.

To address the baseline ecology surveys, the relevant survey areas applied are based on the 'options boundary' which is simply considered to be the southern and northern most offline options. The desktop study considered an area of up to 2km beyond this 'options' boundary for designated sites, notable habitats and species records (up to 1km) obtained from external sources (Figure 10.1).

The survey area for the Phase 1 habitat survey and any potentially present protected species (extended Phase 1) included a 500m buffer zone from what is considered to be the 'options' boundary (any features of interest on or just out with the survey area were included for potential commuting corridors for bat species).

1.3 Objectives

This PEA is intended to record relevant habitats, including any that are formally designated for nature conservation, and to highlight the potential for legally protected or otherwise notable species. This appraisal also makes recommendations for further, detailed surveys that might be required to confirm the presence or likely absence of such species. This is in order to ensure that further ecological surveys and advice is appropriately targeted and reflects the demands of wildlife legislation and government nature conservation policy (Refer to Appendix A for details).

Where these preliminary surveys indicate that there may be impacts to such ecologically sensitive features, a brief outline indication of further survey and / or likely mitigation requirements is also provided.

1.4 Limitations

This report highlights habitats and the potential for notable species evident on the day of survey, combined with recent records obtained from third parties. It does not record any ecological features that may only appear at other times of the year and therefore were not evident at the time of the visit.

A small number of fields were inaccessible due to the presence of electric fencing.

The Phase 1 habitat mapping was undertaken slightly out with the optimal season; therefore the diversity of flowering plants present is unlikely to have been fully represented.

Tree lines and individual mature trees were considered for bat roost potential. Many of the trees assessed showed significant ivy *Hedera helix* growth up the trunk and occasionally along major limbs. Whilst ivy possesses some bat roost potential, it prevented identifying other features such as holes and cracks in the tree.

Despite the limitations detailed above it is considered that there was sufficient information gathered during the survey to inform this PEA.

This report deals with matters of legal significance but does not constitute professional legal advice. The Client may wish to seek professional legal interpretation of the relevant wildlife legislation cited in this document and summarised in Appendix A.

2 Methodology

2.1 Desk Study

A desk study was undertaken in February 2017 to establish whether there were any pre-existing records of designated nature conservation sites or plant and animal species/assemblages of nature conservation significance for the proposed scheme.

The following electronic resources were reviewed for information of relevance to the assessment:

- Multi-Agency Geographic Information for the Countryside website, available at: www.magic.gov.uk, accessed on 17/05/2017.
- Aberdeenshire Council Website, available at: <http://www.aberdeenshire.gov.uk>, accessed on 17/05/2017.
- North East Biological records Centre (NESBReC), available at: <http://www.nesbrec.org.uk>, accessed on 17/05/2017.

A desk study search of sites designated for nature conservation importance was undertaken on the MAGIC website. The search comprised statutory designated sites (e.g. Natura 2000 sites, Ramsar sites and Sites of Special Scientific Interest (SSSIs)).

Additionally, NESBReC were consulted in order to obtain records of protected and notable species for an area extending approximately 1km from the 'options boundary'.

Other local groups/organisations contacted include:

- Scottish Badgers.
- Saving Scotland's Red Squirrels (SSRS).
- Environmental Ranger - Forestry Commission Scotland.

Records of protected or otherwise notable habitats and species within a 1km radius of the 'options' boundaries were obtained from NESBReC. These records were supplemented with a review of all freely-available internet-based resources and other local consultation where appropriate. These combined records were analysed to determine their relevance to the scheme, taking into consideration the dates and locations of each record and the sensitivity of the recorded feature to likely impacts.

It should be noted that a lack of species records within an area may not reflect an absence of that species, but could simply be due to limited recording/survey effort in that area.

2.2 Field Survey

2.2.1 Surveyor information

The surveys were undertaken between the 14th and the 16th March 2017, by Amey ecologists Rhiannon Ferguson (GradCIEEM, ACIEnvSc) and Lorna McRae (GradCIEEM).

2.2.2 Phase 1 habitat survey

Habitats within the survey area were recorded, and the potential for protected or otherwise notable species was assessed. Any incidental sightings or indirect evidence of protected species presence that were observed were recorded and mapped. The habitat survey was carried out in accordance with the Joint Nature Conservation Committee (JNCC), handbook for Phase 1 habitat Survey, 2010 (Ref 2) which was extended to include targeted searches for field signs of red squirrel *Sciurus Vulgaris*, water vole *Arvicola amphibius*, otter *Lutra lutra*, badger *Meles meles*, notable bird species (i.e. barn owl *Tyto alba*), and habitat suitability for protected species. Features with ecological interest (i.e. trees with bat potential) were also recorded to provide supplementary information (Refer to Appendix B).

2.2.3 Badger Survey Methodology

The survey area was assessed for potential habitat to support badgers. Areas of woodland, scrub, hedgerows, grassland, road verges and ditches were searched for signs of badger activity. Badger field signs are described by an SNH commissioned report, 2003 (Ref 3) and Harris *et al*, 1989 (Ref 4) and include:

- Faeces: badgers usually deposit faeces in excavated pits, concentrations of which (latrine sites) are typically found at home range boundaries.

- Setts, comprising either single isolated holes or a series of holes, usually connected underground. The activity of a sett can be assessed as well used, partially used or disused. Setts are generally classified as main, annex, subsidiary and outlier.
- Well-worn paths between setts or leading to foraging areas.
- Scratch marks on tree trunks.
- Snuffle holes (small scrapes where badgers have searched for insects, earthworms and plant tubers).
- Guard hairs (often caught on barb wire or brambles).
- Footprints.

2.2.4 Bat Survey Methodology

Trees and buildings were assessed for bat roost potential in accordance with Collins, et al. *Bat Surveys for Professional Ecologists* (Ref 5). An assessment was also carried out to assess and record habitats suitable for roosting bats (Potential Roost Features (PRF)). Table 2.1 details the guidelines for assessing suitability of PRF's as well as commuting and foraging habitats.

Table 2.1¹: Guidelines for assessing the suitability of habitats for roosting, commuting and foraging bats.

Suitability	Description of roosting habitat	Commuting and foraging habitat
Negligible	Negligible features likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.

¹ Adapted from Collins, J, 2016 (Ref 5)

Suitability	Description of roosting habitat	Commuting and foraging habitat
Low	<p>A structure with one or more potential roost sites that could be used by individual bats opportunistically. However are not suitable on a regular basis or for large numbers.</p> <p>A tree of sufficient size and age to contain PRFs but none seen from ground level.</p>	<p>Habitat that could be used by small number of commuting bats. Features such as hedgerows that aren't intact, un-vegetated river/stream, and not well connected to wider landscape.</p>
Moderate	<p>A structure or tree with one or more PRFs that could be used by bats due to their size, shelter, protection or surrounding habitat.</p>	<p>Continuous habitat connected to the wider landscape and could be used for foraging. Features such as tree lines or scrub.</p>
High	<p>A structure or tree with one or more potential roost sites that are obviously suitable for larger numbers of bats on a regular basis or longer due to their size, shelter, protection or surrounding habitat.</p>	<p>Continuous high quality habitat that's well connected to the wider landscape. Features such as river valleys, streams, hedgerows, tree lines, woodland and grassland for foraging and commuting bats.</p>

2.2.5 Water vole Survey Methodology

An initial habitat assessment was carried out in accordance with Dean, M. *et al.* (2016). *The Water Vole Mitigation Handbook (The Mammal Society Guidance Series)*, (Ref: 6) to determine any requirement for a further detailed survey. River banks were assessed for habitat features which could support a water vole population, these features include:

- Bank profile: steep banks are preferred by water vole to excavate burrow systems.
- Bank substrate: the substrate can be excavated by water vole.
- Availability of above ground nest sites where there are no banks.
- Level of vegetation cover.

- Water habitat – required for predator evasion, can only be a few centimetres deep.

2.2.6 Otter Survey Methodology

During the survey any otter field signs were identified and recorded in accordance with Chanin P (2003). *Ecology of the European Otter* (Ref: 7). There signs included:

- Holts – Otters rest and breed in underground dens (holts) under waterside trees, in old rabbit burrows or in cavities in bank-side rocks. They can be up to 10 metres underground and may have underwater entrances. Mature trees, particularly those with well-developed root systems, leaning trunks and overhanging branches provide ideal holt sites.
- Couches – Otters also use above-ground resting places (couches) which can be built on the banks of a river, and occasionally further inland, often in thick vegetation or reed beds. Depressed areas of vegetation where the otter dries and grooms its fur may also be used as couches.
- Footprints – Tracks can be found in sand and mud alongside rivers and streams. They are five-toed, but often only four toes appear in the print. The large, round prints are approximately 5-7cm in width and 6-9cm in length.
- Droppings – Otters leave spraints (droppings) on rocks or logs close to water. They contain mainly fish scales, bones, shells of crustaceans, feathers or fur. Spraint is variable in size and is normally sweet smelling and a greenish-black colour.
- Otter paths are approximately 12-15cm wide and normally connect with water and holts. They can be marked with spraint.
- Otter slides – from 20cm wide, these are obvious signs where otter have entered the water. Slides can be identified on mud, ice, snow, etc. Sometimes pitted with prints where they have pushed themselves.

2.2.7 Red squirrel

An initial survey was undertaken to assess the 'carrying capacity' of the areas of woodland (considering size, species and age of woodland). Areas of suitable woodland were assessed for signs of red squirrel in accordance with Gurnell *et al*/1994, 2009 (Ref: 8). The following indirect methods were used to determine the potential presence of red squirrels²:

² There is little difference in the feeding signs and dreys of red and grey squirrels. However a precautionary approach was applied and the signs were presumed to be from red squirrels.

- Feeding signs – Squirrels strip the cone from the base up, generally leaving the last few scales at the top of the cone (as they contain less seed). Often find discarded cones and scales where feeding has occurred.
- Dreys – Both red and grey squirrel nests (called 'dreys') consist of an outer shell of twigs along with a soft, insulating inner core of mosses, leaves, conifer needles and grass. Dreys are usually constructed near the main trunk of the tree and are supported by branches. They are usually greater than 50 cm in diameter and more than 30 cm deep. In areas where pine martins are present, dreys can be found further out on branches.
- Red squirrels will also use open platforms of twigs and softer material, or sheltered, disused bird nests for resting in summer.
- Breeding dreys, in which they look after their young, are usually larger and may be lined with soft grass clippings. Red squirrels may use multiple dreys at one time. Individuals have been known to use as many as eight dreys for resting during the day and sleeping at night, although the average is three.
- Sometimes squirrels make nests in holes in trees, called dens.

2.2.8 Breeding birds

Suitable habitat was noted throughout the survey, including areas of woodland, hedgerows, rough grassland, arable fields and farm buildings. Any notable bird species and associated activity were recorded.

2.2.9 Great Crested Newt

A Habitat Suitability Index (HSI) was completed for each of the four waterbodies within the survey area, in accordance with the Amphibian and Reptile Group (ARG) UK HSI guidance, 2010 (Ref: 9).

3 Results

3.1 Desk Study

The investigative searches of the desk study and walkover survey identified a number of ecological features within the study area, comprising designated nature conservation sites, habitats of importance and protected and notable species.

3.1.1 Designated Sites

Statutory Designated Sites

MAGIC identified one statutory designated site within 2km of the 'options' boundary:

- West Bradieston and Craig of Garvock SSSI: this site is located on the south-eastern face of the Hill of Garvock, about 1.7km south of the scheme boundary. The area consists of a diversity of heathland, grassland and fen communities. The SSSI is at a higher elevation and at a significant distance away therefore no ecological connectivity to the scheme.

There were no SAC's/SPA's designated for bats or birds within 10km of the options boundary.

Non-statutory Designated Sites

There are no non-statutory sites within 2km of the 'options' boundary.

3.1.2 Species Data

Red squirrel

There are 90 records of red squirrel (camera trap recordings, sightings, and feeding signs) within 1km of the A90. The majority of records are located in Denlethen Woods (southern edge of survey area) with further signs located along wooded corridors including Gaugers Burn (flows under southern end of the scheme).

Pine martin

There are five records of pine martin (camera trap recordings) within the 1km buffer zone, which are all located within Denlethen Woods.

Badger

There are two records of badger located within Denlethen Woods.

Bats

There are two historic records of bats (*Pipistrelle sp.*) within the area.

Hedgehogs

There are two records of hedgehog *Erinaceus europaeus* within the buffer zone, one road casualty and one within the woodland.

Birds

A variety of bird species have been recorded within the 1km buffer zone, all of which have a red or amber conservation status. There is one record of a dead barn owl (Schedule 1 species). Table 3.1 shows all NESBReC bird records within a 1km buffer of the scheme options.

Table 3.1: Bird species records within 1km buffer zone

BTO code	Common name	Scientific name	Number of records	Conservation status
K.	Kestrel	<i>Falco tinnunculus</i>	2	BoCC - Amber
P.	Grey partridge	<i>Perdix perdix</i>	2	UKBAP, BoCC – Red
L.	Lapwing	<i>Vanellus vanellus</i>	1	UKBAP, BoCC - Red
SN	Snipe	<i>Gallinago gallinago</i>	2	BoCC - Amber
WK	Woodcock	<i>Scolopax rusticola</i>	2	BoCC - Red
CU	Curlew	<i>Numenius arquata</i>	1	UKBAP, BoCC - Red
BH	Black-headed gull	<i>Chroicocephalus ridibundus</i>	2	BoCC - Amber
HG	Herring gull	<i>Larus argentatus</i>	2	UKBAP, BoCC - Red
BO	Barn owl	<i>Tyto alba</i>	1	WCA1, BoCC – Amber, UKBAP
S.	Skylark	<i>Alauda arvensis</i>	3	UKBAP, BoCC – Red
D.	Dunnock	<i>Prunella modularis</i>	3	UKBAP, BoCC - Amber
ST	Song thrush	<i>Turdus philomelos</i>	2	UKBAP, BoCC - Red
SF	Spotted flycatcher	<i>Muscicapa striata</i>	2	UKBAP, BoCC – Red
SG	Starling	<i>Sturnus vulgaris</i>	3	UKBAP, BoCC - Red
HS	House sparrow	<i>Passer domesticus</i>	3	UKBAP, BoCC - Red
LI	Linnet	<i>Carduelis cannabina</i>	3	UKBAP, BoCC - Red
BF	Bullfinch	<i>Pyrrhula pyrrhula</i>	1	UKBAP, BoCC - Amber
Y.	Yellowhammer	<i>Emberiza citrinella</i>	3	UKBAP, BoCC - Red
RB	Reed bunting	<i>Emberiza schoeniclus</i>	1	UKBAP, BoCC – Amber
CB	Corn bunting	<i>Emberiza calandra</i>	1	UKBAP, BoCC-Red
TS	Tree sparrow	<i>Passer montanus</i>	2	UKBAP, BoCC- Red

It should be noted that the above records do not indicate the presence of a species year round. Records may be a result of a summer migrant species, or an incidental sighting of a passage through the area.

3.2 Field Study

3.2.1 Habitats

The following habitat descriptions are based on the Phase 1 habitat survey results. A map depicting the survey area and habitats noted is available in Appendix B (i). References to locations given as 'TN' refer to Target Notes in Appendix B (ii). A purple line boundary has been provided for the purposes of the study area.

The habitats recorded within the study area include the following (listed in approximate order of decreasing extent);

- Arable
- Semi-improved grassland (poor)
- Semi-natural mixed woodland
- Dense and scattered scrub
- Scattered trees
- Planted mixed woodland
- Running water
- Standing water
- Buildings
- Hedgerows
- Improved grassland
- Amenity grassland
- Tall ruderal
- Fence line

Arable

Arable farmland (Photograph 1, Appendix C) is the dominant habitat across the survey area, on both the east and west side of the A90. Arable farmland is utilised for foraging for certain bird species such as yellowhammer and skylark.

Semi-improved grassland (poor)

There are various small sections of semi-improved species-poor grassland interspersed throughout the survey area. These areas appeared to be used as pasture for horses and possess a limited diversity of grass species (Photograph 2, Appendix C).

Semi-natural mixed woodland

There are some small to medium sections of mixed woodland, predominately situated along field boundaries or watercourses (Photograph 3, Appendix C). The larger section of woodland on the southern edge of the survey area consisted mainly of immature deciduous species such as beech *Fagus sylvatica* and silver birch *Betula pendula*, some mature conifers and rhododendron *Rhododendron ferrugineum*. In the northern section of the survey area (east side of A90) there was a small section of deciduous woodland and a strip of coniferous woodland, within the arable fields. There is a wooded corridor that borders Kirk burn (mature trees, covered in ivy), and a small section of woodland along Gaugers burn.

Scattered trees

The most prominent treeline (mixed) is situated on the eastern side of the A90 and runs parallel to the B9120. The dominant species consisted of beech and pine *Pinus Sp.*, with some scrubby undergrowth (Photograph 4, Appendix C). Kirk Burn was bordered by a tree line, with ash *Fraxinus excelsior* as the dominant species. There are various other tree lines bordering arable fields throughout the survey area.

Dense and scattered scrub

There are sections of scrub spread throughout the survey area, mainly along field boundaries or bordering watercourses. Dominant species comprised of hawthorn *Crataegus monogyna*, gorse *Ulex europaeus*, broom *Cytisus scoparius* and immature tree species (Photograph 5, Appendix C).

Planted mixed woodland

There is a large area of planted woodland (Denlethen woods) in the south west section of the survey area (Photograph 6, Appendix C). The majority of the woodland was coniferous, consisting mainly of pine species and spruce *Picea sp.* There are some deciduous pockets around the woodland edge including birch, beech and ash.

Running water

There are two main water courses which bisected the A90, within the survey area, Gaugers Burn (Photograph 7, Appendix C) and Kirk Burn. These two burns flowed into Luther Water, which ran parallel to the A90 to the north west of Laurencekirk. There are numerous field drains throughout the survey area, which generally flowed back into either Kirk or Gaugers burn.

Standing water

There are approximately four areas of standing water, situated at the southern end of Laurencekirk. Two were connected to field drains, one is an isolated pond within Denlethen woods (Photograph 8, Appendix C), and one is a SUDs basin within Laurencekirk.

Buildings

The majority of buildings are residential and centred on the high street. There are also various farm properties (Photograph 9, Appendix C) spread throughout the survey area, some of which hold potential for barn owl *Tyto alba*, swallows *Hirundo rustica*, swifts *Apus apus*, house martins *Delichon urbica*, as well as bat species.

Fence line/Hedgerows

The majority of field boundaries are defined by post and wire fencing. There are a few boundaries marked with hedgerows which comprised of rowan *Sorbus aucuparia*, hawthorn, and beech (Photograph 10, Appendix C).

Improved grassland

There are areas of improved grassland throughout the site, with the majority situated in the central section of Laurencekirk, adjacent to residential properties (Photograph 11, Appendix C).

Amenity grassland

There are small areas of amenity grassland (Photograph 12, Appendix C) around properties/areas of public land.

Tall ruderal

There are some small sections of tall ruderal species spread throughout the survey area, with the majority concentrated to the northern end of Laurencekirk. These areas are dominated by rosebay willowherb *Chamerion angustifolium* (Photograph 13, Appendix C).

3.2.2 Fauna

Badger

The surrounding landscape has potential to support a badger population due to the foraging opportunities (open grassland/arable land), connectivity (wooded/scrub corridors), and areas of woodland. Limited signs of badger activity were recorded throughout the site including three old dung pits (Photograph 14, Appendix C), some well-worn pathways through vegetation and a footprint. There was one potential outlier sett identified, it is considered to be used by fox or rabbit.

Bats

The surrounding habitat was assessed as having 'moderate' foraging and commuting habitat (Table 2.1). Various structures/buildings and trees were noted as having low to medium roost potential (Photograph 15, Appendix C). The majority of the land is arable in nature, however there is good connectivity throughout the area via commuting corridors (tree lines/watercourses).

Red squirrel

There are suitable areas of mature woodland (Denlethen) and wooded corridors to support red squirrel within the survey area. Feeding signs (Photograph 17, Appendix C) and squirrel feeders (Photograph 16, Appendix C) was identified within Denlethen woodland. A possible drey was identified at NO 71630 70013 (TN 74). No other signs were identified throughout the site; however considering the volumes of records and the suitability of the habitat it is likely that red squirrels are present throughout the survey area.

Otter

Two otters were seen on an earlier sight visit (February 2017) at Luther water to the north west of Laurencekirk. No definitive signs of otter were observed during the preliminary survey; however there are two small water courses (Gaugers burn and Kirk burn) as well as numerous other field drains which have the potential to support an otter population. Mammal paths were recorded throughout the survey area and possible otter slides.

Water vole

All the watercourses (and surrounding vegetation) in the survey area are suitable to support a water vole population. A potential water vole burrow was noted at National Grid Reference (NGR) NO 72861 71434 (Photograph 18, Appendix C); however no other field signs were identified.

Reptiles

Some suitable habitat and possible refuge sites (NO 71535 70827 and NO 72408 72179, TN 56) were identified within the survey area; however no definitive signs were observed. Refer to Photographs 19-20, Appendix C.

Great Crested newt (GCN)

There are four areas of standing water within the survey area, which had the potential to support GCN. All waterbodies scored as 'poor' when assessed against the Habitat Suitability Index (HSI). Full results are located in Appendix E.

Fish

Luther water and the associated burns (Gaugers and Kirk Burn – see Figure 10.5) are part of the River Esk catchment, which supports a freshwater fish population. The water courses present throughout the survey area are suitable to support fish populations.

Birds

The habitats present are considered suitable to support various bird species, with the following notable bird species recorded; yellowhammer, skylark, tree sparrow *Passer montanus*, house sparrow *Passer domesticus*, starlings, buzzard *Buteo buteo*, common gull *Larus canus*, black headed gull *Chroicocephalus ridibundus*, and song thrush.

Other fauna

Frog spawn (Photograph 21, Appendix C) was identified in a small pond, within Denlethen Woodland.

3.2.3 *Invasive species*

Areas of rhododendron were identified throughout the survey area, with the majority of areas located on private land.

One stand of Japanese knotweed was identified within private property at the eastern extent of the survey area (Photograph 22, Appendix C)

4 Recommendations for Further Survey Work

Recommendations for further species specific surveys for the Stage 2 assessment have been made based on the results of this preliminary study. These should be implemented with full consideration of wildlife legislation described in Appendix A and seasonal restrictions shown in Appendix E. The results of further survey work may indicate that a protected species licence/s is/are required in order to destroy/disturb certain species sett/burrows/holts/roosts etc. dependent on the junction improvements design. Applicable licences and potential mitigation is briefly detailed in Section 5.

4.1 Fauna

4.1.1 *Otter/water vole*

Detailed surveys will need to be undertaken on the two main water courses (Gaugers Burn and Kirk Burn) as well as any field drains that are likely to be impacted by the proposed works. Water vole surveys will be completed once during the early season (May) and once during the later season (August). Otter surveys should be undertaken at the same time.

4.1.2 *Red squirrel*

It is recommended that baited hair tubes are set up within the strips of woodland which are situated within or close to the options boundary. This will help determine whether red squirrels are using these areas to commute and/or forage.

4.1.3 *Bat*

Activity surveys

These should be carried out to confirm the species present on site, the temporal and spatial distribution of bat activity and how the habitat is used and connected to other habitats in the area. These should take place between April and October and be carried out under good weather conditions (i.e. above 10°C, no rain or strong wind).

Preliminary roost assessments (Stage 3)

Buildings and structures must undergo detailed inspections of the exterior (and where possible interior) to look for features that bats could use to gain access to a roost and any signs to indicate presence. These can be carried out at any time of year.

Tree surveys (Stage 3)

Trees that have been identified as having features that may support roosting bats, must undergo a detailed tree survey. A licenced ecologist should access each tree and inspect each feature (including holes, loose bark, ivy, cracks and cavities). Further presence/ absence surveys may be required following this. These should take place between April and October and be carried out under good weather conditions (i.e. above 10°C, no rain or strong wind).

4.1.4 Birds

A breeding bird survey should be undertaken in the early season (April/May) and in the later season (June) to establish what species are present in the areas, territories and nesting habitat.

4.1.5 Reptiles

Small sections throughout the site were identified as having reptile potential (foraging/refuge); therefore it may be required to undertake a targeted survey at Stage 3 depending on the areas impacted.

4.1.6 Fish

A fish survey is required to identify species within the burn and any potential spawning habitat and the importance of such habitats.

4.1.7 Aquatic invertebrates

An aquatic invertebrate survey is recommended to consider the biodiversity of the invertebrates within Gaugers burn and Kirk Burn, this will classify the water quality within these areas.

4.2 Invasive species

Japanese knotweed and Rhododendron were the only invasive species noted throughout the survey area; however the majority of stands were on private land.

5 Summary & Conclusions

The Preliminary Ecological Appraisal has identified areas of high quality habitat and the potential for various protected species to be present. This report identifies what further survey work is required to assess the impact on ecological receptors within the study area. The results of further survey work will inform the option selection process and Environmental Impact Assessment to assess how ecological receptors will be impacted.

As a result of these potential constraints for the project, and dependant on findings from further survey work, mitigation required may include (but is not limited to):

5.1 Habitat loss

The majority of habitat loss will be from arable fields, with some treelines and watercourses also being affected. There will be habitat fragmentation as a result of the works and efforts should be made to enhance disturbed habitat sections and/or maintain connectivity.

5.2 Red squirrel

Plan the timing of work to avoid the breeding season, i.e. February to September, to avoid orphaning young animals or destroying breeding dreys. Avoid felling trees within 50m of any dreys occupied in the breeding season to avoid disturbance.

If red squirrels are found to be using the woodland corridors, mitigation will need to be put in place to ensure connectivity is maintained such as rope bridges (Ref 10).

Compensatory woodland areas may be needed to offset any losses of habitat. This should be similar in quality and quantity to provide alternative habitat. Any woodland would need to be at least 15 years of age to offer suitable habitat for displaced animals. This would require considerable pre-planning or planning across a wider area and timescale. Tree species should be tailored to red squirrel preferences.

5.3 Bats

If any bats are found roosting within any impacted trees or structures, then a European Protected Species (EPS) licence from SNH (for disturbance/destruction) may be required. This will need to be supervised/undertaken by a licenced bat worker.

5.4 Otter

If any otter holts are likely to be disturbed or destroyed by the works, an EPS licence may be required from SNH. If there is culverting of watercourses, ledges may be required to allow safe passage for otters.

5.5 Water vole

If a water vole population is discovered a protected species licence may be required from SNH (disturbance/destruction). Trapping and translocation may be required depending on proximity to the works.

5.6 Fish

If Gaugers Burn of Kirk Burn are identified as important spawning habitats it may be necessary to design culverts to allow fish passage.

6 References

- Ref 1: Chartered Institute for Ecology and Environmental Management. (2013). *Guidelines for Preliminary Ecological Appraisal*. CIEEM, Winchester.
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- Ref 5: Collins, J.⁸ (ed.) (2016) *Bat Surveys for Professional Ecologists, and Good Practice Guidelines*, 3rd Edition, The Bat Conservation Trust, London
- Ref 6: Dean, M. Strachan, R. Gow, D. and Andrews, R. (2016). *The Water Vole Mitigation Handbook (The Mammal Society Guidance Series)*. The Mammal Society, London.
- Ref 7: Chanin P (2003). *Ecology of the European Otter*. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.
- Ref 8: Gurnell J, Lurz P, McDonald R, Pepper H, (2009) Practical techniques for surveying and monitoring red squirrel. Forestry Commission
- Ref 9: ARG UK (2010). *ARG UK Advice Note 5: Great Crested Newt Habitat Suitability Index*. Amphibian and Reptile Groups of the United Kingdom.
- Ref 10: Red squirrel rope bridges, <https://scottishsquirrels.org.uk/news/article/how-can-we-reduce-road-deaths/>

Appendix A Wildlife Legislation and Policy

The Wildlife & Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 amendments in 2001 consolidates and amends existing national legislation to implement the Convention of European Wildlife and Natural Habitats (Bern Convention) and Council Directive 2009/147/EC on the conservation of wild birds (Birds Directive) in Great Britain. The Act makes it an offence to intentionally or ((recklessly) – only under the Nature Conservation Act (Scotland) Act (2004)) kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturb animals occupying such places. The Act makes it an offence (with exception to species listed in Schedule 2) to intentionally:

- Kill, injure or take any wild bird
- Take, damage or destroy the nest of any wild bird while that nest is in use or being built
- Obstruct or prevent any wild bird from using its nest
- Take destroy an egg of any wild bird
- Disturb any wild bird listed on Schedule 1 whilst it is building its nest or is, on, or near a nest containing eggs or whilst lekking
- Disturb the dependant young of any wild bird listed on Schedule 1.

It is an offence to “plant or otherwise cause to grown any plant in the wild out with its native range”.

Wildlife and Natural Environment (Scotland) Act 2011

The Wildlife and Natural Environment (Scotland) Act 2011 amended the Wildlife and Countryside Act 1981 and other pieces of legislation. Modernising and strengthening protection for badgers, and licensing of other protected species, and regulating invasive and non-native species.

Conservation (Natural Habitats &c.) Amendment (Scotland) Regulations

The Conservation (Natural Habitats &c.) Regulations 1994 regulations transposed Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into national law. In Scotland the Habitats Directive is transposed through a combination of the Habitats Regulations 2012 (in relation to reserved matters) and the 1994 Regulations. The Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4.

Nature Conservation (Scotland) Act 2004

The Act sets out a series of measures which are designed to conserve biodiversity and to protect and enhance the biological and geological natural heritage of Scotland. In doing so, the Act provides the principal legislative components of a new, integrated system for nature conservation within Scotland. The Act is in five parts and contributes to the new system for nature conservation by means of a combination of both new measures and amendments to existing legislation.

The Protection of Badgers Act 1992

Badger and their setts are protected under this Act, and the Wildlife and Natural Environment (Scotland) Act 2011. Under these Acts it is an offence to:

- Wilfully kill, injure, take or attempt to kill, injure or take a badger
- Possess a dead badger or any part of a badger
- Cruelly ill-treat a badger
- Knowingly cause or permit unlawful act relating to badger
- Interfere with a badger sett by intentionally or recklessly cause or allowing:
 - Damage to sett or any part there of
 - Destruction of a sett
 - Obstruction of access to a sett
 - Causing a dog to enter a sett
- Disturbing a badger while occupying a sett.

The Wild Mammals (Protection) Act 1996

The Wild Mammals (Protection) Act 1996 makes it an offence for any person to mutilate, kick, beat, nail or otherwise impale, stab, burn, stone, crush, drown, drag or asphyxiate any wild mammal with intent to inflict unnecessary suffering.

The Animal Welfare Act 2006

This imposes a duty of care on anyone responsible for an animal to take reasonable steps to ensure that the animal's needs are met. This means that a person has to look after the animal's welfare and ensure that it does not suffer. The Act says that an animal's welfare needs include:

- a suitable environment;
- a suitable diet;
- the ability to exhibit normal behaviour patterns;
- any need it has to be housed with, or apart from, other animals; and
- protection from pain, suffering, injury and disease.

With regards to development, this may have implications when capture and translocations of animals are proposed.

Scotland's Biodiversity: It's in your hands (2004)

This document outlines a 25 year plan to conserve and enhance biodiversity in Scotland. With an aim "to conserve biodiversity for the health, enjoyment and wellbeing of the people of Scotland now and in the future". There are five main objectives encompassed within this document:

- Species and habitats – To halt the loss of biodiversity and continue to reverse previous losses through habitat and species action plans
- People – To increase awareness, understanding and enjoyment of biodiversity, and engage many more people in conservation.
- Landscapes and ecosystems – Restore biodiversity in urban, rural and marine environments through planning, design and practice
- Integration and co-ordination – develop a management framework that ensures biodiversity is taken into account
- Knowledge – ensure that the knowledge on biodiversity is available to all policy makers and practitioners.

**Appendix B (i) Preliminary Ecological Appraisal (Extended
Phase 1 map)**



Appendix B (ii) Target notes

Target note ID	Location (NGR)	Description
1	NO 70042 70628	Denlethen Wood - coniferous woodland with potential for red squirrel, pine marten, Scottish wildcat and badger.
2	NO 69734 70261	Tree with low bat potential - rot hole
3	NO 69728 70256	Tree with LBP - small cavity
4	NO 69675 70169	yellowhammer
5	NO 69638 69957	yellowhammer
6	NO 69869 69858	Building with bat potential and barn owl potential
7	NO 70152 70028	Nest box
8	NO 70183 70063	Nest box
9	NO 70224 70099	Rail bridge with bat potential
10	NO 70203 70114	Nest box
11	NO 69995 70257	Coniferous woodland with potential for red squirrel, pine marten, Scottish wildcat and badger.
12	NO 70011 70281	Log pile - potential reptile refuge
13	NO 70061 70315	Mammal activity - likely rabbit
14	NO 70343 70815	Nest box
15	NO 70461 70769	Frog spawn - Situated around the edge of woodland pond

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Target note ID	Location (NGR)	Description
16	NO 70450 70811	Water vole/ otter potential
17	NO 70459 70848	Song thrush
18	NO 70487 70836	8 nest boxes within close proximity
19	NO 70430 70937	Red squirrel feeder and feeding signs
20	NO 70361 70951	Red squirrel feeder and feeding signs
21	NO 70346 70964	Red squirrel feeder and feeding signs
22	NO 70361 70988	Four nest boxes in close proximity
23	NO 70347 71033	Red squirrel feeding signs
24	NO 70338 71019	Potential refuge/hibernaculum
25	NO 70540 71228	Potential water vole/ otter
26	NO 70568 71214	Tree with MBP - Cracks, small rot holes
27	NO 70637 71356	Black headed gull flying overhead
28	NO 70936 71523	Farm building with bat/barn owl potential
29	NO 71288 71431	Black headed gull x5 flying overhead
30	NO 71303 71768	Broad-leaved woodland (predominantly beech) area with low bat potential (ivy, small rot holes)
31	NO 71137 71969	Tree line - bat commuting
32	NO 71630 71744	Railway bridge - bat potential
33	NO 71630 71744	Rhododendron on railway line
34	NO 71864 71611	Otter/ water vole potential
35	NO 71900 71587	Rhododendron on burn

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Target note ID	Location (NGR)	Description
36	NO 72023 71486	Woodland with LBP - ivy and few rot holes
37	NO 72184 71349	Tree line suitable for bat commuting
38	NO 71971 71130	House sparrows observed
39	NO 71996 70986	Rhododendron
40	NO 71682 70792	Skylark in field
41	NO 71535 70827	Reptile potential
42	NO 71417 70953	Nest box
43	NO 72211 72248	Railway bridge with bat potential
44	NO 72211 72248	Rhododendron on track
45	NO 72296 72213	Farm buildings with bat potential
46	NO 72269 72234	Potential refuge/hibernaculum
47	NO 72147 72352	2 skylarks in field
48	NO 72142 72356	Otter/ water vole potential
49	NO 72138 72359	Flock of 5 yellowhammers observed.
50	NO 72409 72487	Culvert with bat potential
51	NO 72412 72491	Otter/ water vole potential
52	NO 72473 72630	Building with bat/barn owl potential
53	NO 72483 72682	Tree sparrow observed
54	NO 72492 72714	Otter/water vole potential
55	NO 72408 72179	Reptile potential

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Target note ID	Location (NGR)	Description
56	NO 72689 72447	Reptile potential
57	NO 72779 73011	Bridge with low bat potential
58	NO 72479 73005	Otter/water vole potential
59	NO 72311 72188	House sparrows observed (15+)
60	NO 70624 69361	Otter/ water vole potential
61	NO 70623 69370	3 mallard observed in field
62	NO 70622 69372	Skylark heard in field
63	NO 70635 69446	Tree with LBP - Missing limb
64	NO 70634 69455	Tree with MBP - rot holes, cracks
65	NO 70638 69476	Tree with LBP - rot hole
66	NO 70641 69478	Tree with LBP - rot hole
67	NO 70536 69593	Building with bat/barn owl potential
68	NO 70483 69599	Tree with MBP - cracks/cavity
69	NO 70378 69554	Tree line with bat potential
70	NO 70351 69580	Otter/ water vole potential
71	NO 71695 69996	Red squirrel potential
72	NO 71696 69993	Potential hibernaculum/refuge
73	NO 71630 70013	Potential red squirrel drey
74	NO 71761 70155	Building bat potential
75	NO 72404 70241	Rhododendron

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Target note ID	Location (NGR)	Description
76	NO 72486 70310	Badger dung (old)
77	NO 72481 70308	Buzzard observed overhead
78	NO 72462 70292	Badger dung (old)
79	NO 72351 70252	Otter/ water vole potential
80	NO 72713 70529	Otter/ water vole potential
81	NO 72823 70837	Farm building with bat potential
82	NO 72801 70867	Male yellowhammer observed
83	NO 72715 70507	Japanese knotweed stand
84	NO 72825 71331	Tree with LBP - bark
85	NO 72860 71424	Skylark heard in field
86	NO 72861 71434	Potential water vole burrows and feeding signs
87	NO 72636 71985	Small bridge with bat potential
88	NO 72758 71602	large mammal hole - potentially disused outlier sett, possibly used by fox)
89	NO 73281 72213	Old badger dung
90	NO 73149 72253	Otter/ water vole potential
91	NO 72572 71107	Tree line with moderate bat potential
92	NO 72808 72176	Starlings observed (20+)
93	NO 72855 72145	Red squirrel potential
94	NO 72856 72137	Otter/ water vole potential
95	NO 73039 72651	Otter/ water vole potential

Project NameA90 Laurencekirk, Junction Improvements

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Target note ID	Location (NGR)	Description
95	NO 73159 72610	Potential abandoned outlier sett.

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Document Title Preliminary Ecological Appraisal



Appendix C Photographs



Photograph 1: Arable land



Photograph 2: Semi-improved grassland (poor)



Photograph 3: Semi-natural woodland



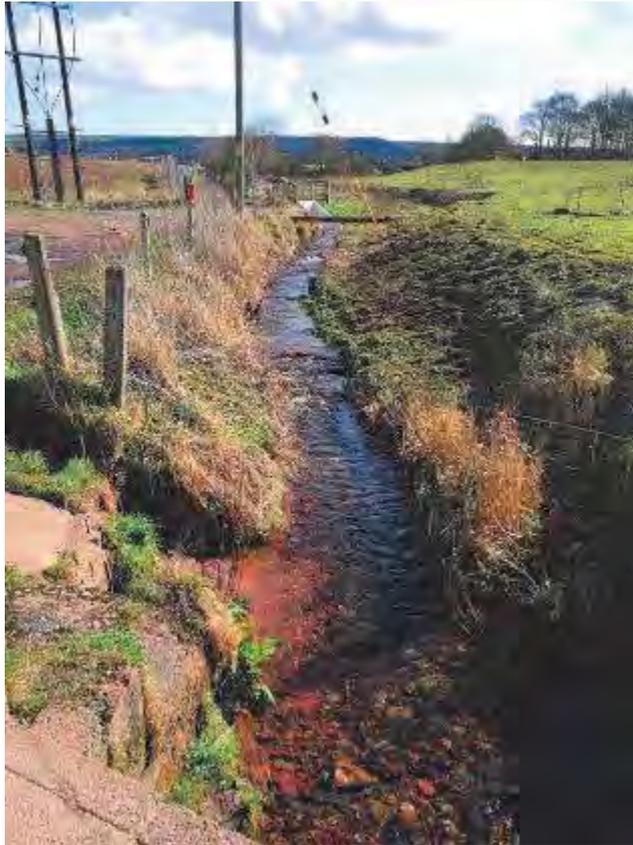
Photograph 4: Scattered treeline



Photograph 5: Scrub



Photograph 6: Plantation woodland



Photograph 7: Gaugers burn



Photograph 8: Standing water



Photograph 9: Farm building



Photograph 10: Hedgerow



Photograph 11: Improved grassland



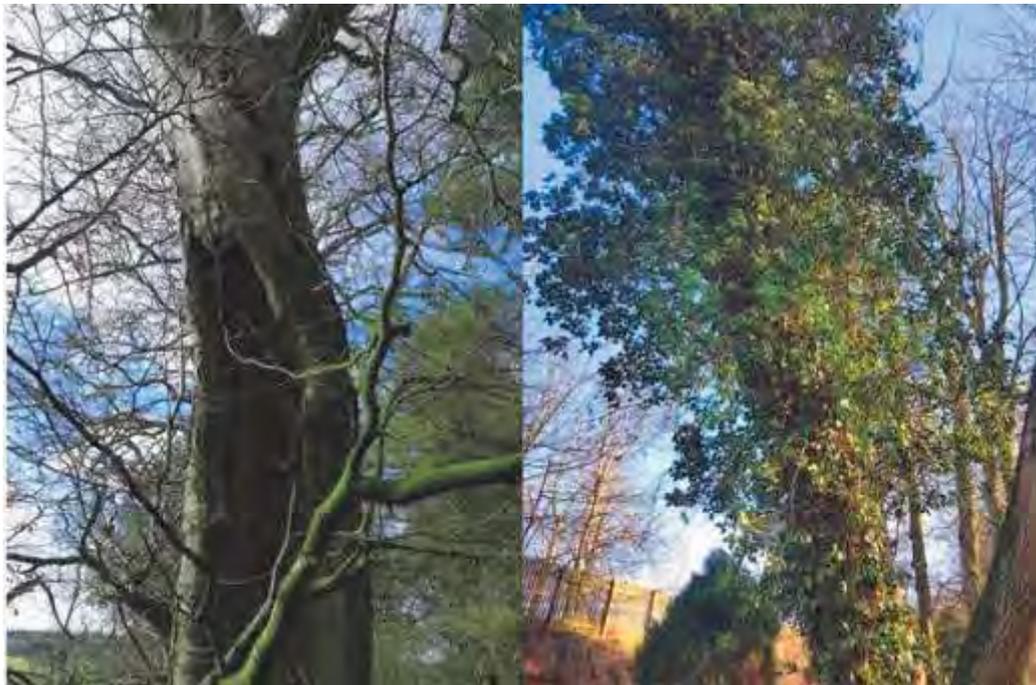
Photograph 12: Amenity grassland



Photograph 13: Tall ruderal



Photograph 14: Dung pit



Photograph 15: Bat roost potential



Figure 16: Red squirrel feeder



Figure 17: Red squirrel feeding signs



Figure 18: potential water vole burrow



Photograph 19: potential reptile refuge



Photograph 20: Suitable reptile habitat



Photograph 21: Frog spawn



Photograph 22: Japanese knotweed



Figure 23: Small bridge with bat potential at Burnside Cottage



Appendix D Survey Calendar

Ecology Survey Timing - Indicative Calendar

Species	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Great Crested Newt	Hibernation		Pond surveys	Pond surveys		Pond surveys	Habitat Suitability Assessment only				Hibernation	
Reptiles	Hibernation		Limited activity	Artificial refuge surveys			Reduced basking time		Artificial refuge surveys	Limited activity	Hibernation	
Dormouse	Hibernation			Nest tube/box survey.								
Badger	Limited sett/bait surveys	Bait marking & sett surveys			Sett surveys				Sett surveys			Limited sett/bait surveys
Bats	Hibernation roost survey			Summer roost & activity surveys					Hibernation roost survey			
Roost potential and close inspections of roosts possible all year. Trees are best inspected (for potential) in winter.												
Nesting Birds	No to low nesting activity			Nesting activity					No to low nesting activity			
Water voles	Reduced activity		Field-sign surveys									Reduced activity
Otter	Field-sign surveys		Field-sign surveys		Field-sign surveys							
White-clawed crayfish				trapping restricted								
Botanical				Reduced flowering	Main flowering season			Reduced flowering				

Key to timing:

- Optimal survey period
- Sub-optimal survey period
- Surveys unreliable

NOTE: Timing shown is indicative and may vary depending on weather and region. Some surveys may require licences.

Appendix E HSI

Table 6.1

	Pond Name	1	2	3	4
	Grid Ref				
SI No	SI Description	SI Value	SI Value	SI Value	SI Value
1	Geographic location	0.01	0.01	0.01	0.01
2	Pond area	0.9	0.4	0.2	0.95
3	Pond permanence	0.9	0.9	0.5	0.9
4	Water quality	1	0.67	0.01	0.01
5	Shade	1	1	1	1
6	Water fowl effect	0.67	0.67	0.01	1
7	Fish presence	0.67	0.67	1	1
8	Pond Density	0.1	0.1	0.45	0.45
9	Terrestrial habitat	1	0.33	0.67	0.33
10	Macrophyte cover	0.5	0.7	0.4	0.6
HSI Score		0.42	0.35	0.16	0.31
Pond suitability (see below)		Poor	Poor	Poor	Poor

Project Name A90 Laurencekirk, Junction Improvements
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Appendix F Consultation

From: Simpson, Louise [<mailto:Louise.Simpson@forestry.gsi.gov.uk>]
Sent: 15 February 2017 14:04
To: Ferguson, Rhiannon
Subject: RE: Denlethen Woods - Red squirrels

Hi Rhiannon,

Yes, there are red squirrels in Denlethen wood, and we have dreys recorded. We are not carrying out a monitoring project, but I don't know if the "Friends of Denlethen" community group are doing anything. If we are thinning or felling an area in Denlethen I carry out drey surveys before work begins, along with general pre-ops surveys for species/habitats/archaeology.

Sorry, I don't understand your question about level of forestry activity, can you describe what information you need to know?

Louise

Louise Simpson
Environment Ranger

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www.forestry.gov.uk/scotland
www.facebook.com/forestrycommissionscotland

Forest Enterprise Scotland is an agency of Forestry Commission Scotland and manages the National Forest Estate

Protected Species Survey Report

A90 Laurencekirk Junction Improvement Scheme

CO25000276 / PSSR Revision 0

12/08/2019

ameyconsulting



**TRANSPORT
SCOTLAND**
CÒMHDHAIL ALBA

Document Control Sheet

Project Name:	A90 Laurencekirk Junction Improvement Scheme
Project Number:	CO25000276
Report Title:	Protected Species Survey Report
Report Number:	PSSR

Issue Status/Amendment	Prepared	Reviewed	Approved
First issue	Name: Lorna McRae / Jennifer Reid Signature:  Date: 16/12/2018	Name: Kate Hunt Signature:  Date: 29/03/2019	Name: Helen Craig Signature:  Date: 12/08/19
	Name: Signature: Date:	Name: Signature: Date:	Name: Signature: Date:
	Name: Signature: Date:	Name: Signature: Date:	Name: Signature: Date:
	Name: Signature: Date:	Name: Signature: Date:	Name: Signature: Date:

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1. Introduction

1.1. Background

- 1.1.1 The A90 is the main strategic link between Dundee and Aberdeen. The settlement of Laurencekirk is situated approximately 40km south of Aberdeen.
- 1.1.2 There are three junctions within the A90 that give access to Laurencekirk, namely the A937 north junction, the central B9120 staggered junction (giving access to St Cyrus) and the A937 south junction, where the staggered southern leg gives access to the A937 and Montrose area.
- 1.1.3 The scheme is a grade-separated junction positioned at the location of the existing junction of the A937 single carriageway (Laurencekirk-Montrose local authority road) with the A90 dual-carriageway (Dundee-Aberdeen trunk road) to the south-west of Laurencekirk (see Figure 1.2 in the Stage 3 Environmental Statement (ES)). Works are estimated to start July 2022 and take approximately 14 months to complete.
- 1.1.4 Drainage for the grade-separated junction will be conventional filter with carrier drains leading to a Sustainable Drainage System (SuDS) attenuation facility and ultimately discharging to the nearest watercourses (Gaugers Burn and an unnamed watercourse near Mains of Newton). These watercourses feed into the Luther Water north-west of Laurencekirk then into the River North Esk near North Water Bridge, approximately 4 miles south-west of Laurencekirk.
- 1.1.5 Amey Consulting was tasked to undertake various ecological surveys to support an Ecological Impact Assessment (EcIA) within the Environmental Statement (Stage 3) (with input from data previously gathered from Stage 1 and 2 by Amey). These surveys are to inform baseline conditions of the survey area.

1.2. Study area and location

- 1.2.1 The study area this scheme is concerned with is located in the north east of Scotland, approximately 40km south of Aberdeen, within Aberdeenshire Council. The 'scheme' in this report is defined as the design of the A937 south junction (National Grid Reference (NGR) NO 70805 70189). The surrounding area consists of predominantly arable farmland, interspersed with areas of grassland, woodland and watercourses.

Bat

- 1.2.2 Bat activity surveys were carried out within a 500m buffer of the scheme, with walked transects strategically planned according to features of potential importance (i.e. mature tree lines, woodland edges). Transects were also planned to ensure the safest route for the surveyors and allow for safe crossing over watercourses and the live railway.
- 1.2.3 A static bat survey was carried out at the woodland edge near Gaugers Burn, about 450m west of Johnston Lodge at approximate NGR NO 71307 70270. The survey location is the boundary between mixed woodland plantation and arable farmland.

Breeding/ wintering bird

- 1.2.4 A 500m buffer was applied to the breeding and wintering bird surveys; transects were walked by the surveyors to map territories and identify species.

Red squirrel

- 1.2.5 Red squirrel surveys were undertaken along the woodland adjacent to Gaugers Burn for up to 500m either side of the existing A90.

Badger

- 1.2.6 A badger *Meles meles* survey was carried out within 100m of the proposed scheme.

Otter/ water vole

- 1.2.7 An otter/ water vole survey was undertaken along Gaugers Burn and the unnamed watercourse near Mains of Newton, which included up to 500m either side of the existing A90.

Aquatic invertebrates

- 1.2.8 The area for survey comprised the Gaugers Burn from Gaugers Bridge (NGR NO71017066) where it is crossed by the A937, southward passing under the A90 down to Johnston Lodge (NGR NO71497010), a length of approximately 800m.

1.3. Objectives

- 1.3.1 The objective of the surveys was to confirm presence/ likely absence of protected, rare or notable species and assess the quality of valuable habitats. This is to ensure that further ecological survey and advice is appropriately targeted and reflects the demands of wildlife legislation and government nature conservation policy (refer to Table 10.1 in the Stage 3 Environmental Statement for details).
- 1.3.2 This report is intended to provide baseline conditions for the ecological receptors. An Ecological Impact Assessment will be provided within the Ecology and Nature Conservation chapter of the Environmental Statement which accounts for the construction and operational impacts of the design, and details appropriate mitigation.

1.4. Survey limitations

Bat

- 1.4.1 The Anabat Express static bat detector that was deployed did not produce usable recordings at the end of May, August and September 2018. There was a SIM card error at the end of May, and then the microphone was faulty in August and September. Recordings analysed are from the end of June into early July only. This unforeseen constraint limited the extent of valid data.
- 1.4.2 Only bats within range of the microphone are recorded. The range varies depending on the volume and frequency of bat calls, as well as weather conditions. (The weather was fairly consistent throughout the survey period.)
- 1.4.3 There was rainfall on the night of 8th July only. Moisture on the microphone may have partially blocked sound from being received. There was reduced bat activity this night but is more likely as a result of the reduced activity due to rain rather than unrecorded as calls were still recorded.
- 1.4.4 Static bat surveys do not include an accurate count of bats and do not include observations of bat behaviour but can be a useful aid to gauging the extent of general bat activity in the immediate surrounding area.

Breeding/ wintering bird

- 1.4.5 Inevitably with any ecological survey it cannot be guaranteed to detect all species and individuals, and surveys cannot be fully representative of all conditions (e.g. severely reduced visibility). In this case it was concluded that the baseline surveys provide a robust data set.
- 1.4.6 It is recognised that bird detectability (accurate counts and identification of bird species) can be a limitation in all bird surveys. Detectability is limited by a range of factors including distance between surveyors and birds, weather conditions, equipment used and surveyor competence. Bird detectability was taken account of during the wintering bird surveys. Potential limitations as regards detectability were minimised by a range of techniques; these included use of the same equipment during all surveys, avoiding weather conditions with poor visibility, and making multiple observations from vehicles (vantage counts and point counts) throughout each survey period to limit disturbance and to reduce observation distances.

Red squirrel

- 1.4.7 There were no significant limitations associated with the red squirrel survey.

Badger

- 1.4.8 There were no significant limitations associated with the badger survey.

Otter/ water vole

- 1.4.9 There were no significant limitations associated with the otter/ water vole survey.

Aquatic invertebrates

- 1.4.10 All aquatic invertebrate surveys are a sample of what is present in the specific location at a particular time. They will not collect samples of species which are not in their aquatic form and larvae which are too young to be identifiable to species (generally considered to be earlier than the fifth instar) may be collected but won't contribute to the assessment. It was, however, considered that a sufficient sample was collected to fully inform this assessment report.
- 1.4.11 Due to the size of the area potentially to be affected, and the proportionally small area sampled compared to the number and diversity of invertebrate species present on any site it is unlikely that a complete species list would be produced from the sampling procedure. Therefore, it is possible some rare and / or endangered species present in low numbers could be undetected; however, the methodology is designed to assess the quality of habitat and the likelihood that rare or endangered species might be present and assess the overall assemblage. Therefore, this is not considered a significant limitation.

2. Methodology

2.1. Bat

Activity surveys

- 2.1.1 Activity surveys were carried out in accordance with Bat Conservation Trust. Bat Surveys for Professional Ecologists: Good Practice Guidelines (2016) (Ref (1)) and Mitchell-Jones and McLeish, The Bat Workers' Manual (Ref (2)).
- 2.1.2 Three transects were walked within the survey area, and included dusk surveys (commenced approximately 30 minutes prior to sunset and continued at least 90 minutes after sunset) and a dawn survey (commenced approximately 2 hours prior to sunset and continued until sunrise). All transects were undertaken between July and September. The transect routes were selected to include landscape features such as mature trees lines and woodland edges that were identified in the Preliminary Ecological Appraisal (PEA) (Ref (3)).
- 2.1.3 Visual observations of bats were aided with the use of ultra-sonic bat detectors. Batbox Duets were used, which are a combination of heterodyne and frequency division detectors. Bat calls were recorded using a digital voice recorder.
- 2.1.4 The transect routes taken were altered where possible, by alternating the starting point of the transects. This allowed for the different emergence time of bat species and provided a more comprehensive overview of activity.

Table 1 details the weather conditions experienced during the surveys.

Table 1: Weather conditions experienced during bat activity surveys

Date	Transect number	Survey	Sunset/sunrise	Cloud cover (oktas)	Wind	Rain	Temperature
17/07/2017	1	Dusk	21:49	1	0	0	16
18/07/2017	1	Dawn	04:43	0	0	0	14
18/07/2017	2	Dusk	21:50	4	0	0	16
19/07/2017	2	Dawn	04:45	8	1	0	16
07/09/2017	3	Dusk	19:54	7	1	0	14
08/09/2017	3	Dawn	06:32	4	0	0	11
11/09/2017	1	Dusk	19:44	1	2	0	15
12/09/2017	2	Dusk	19:38	8	1	0	12

- 2.1.5 A total of 24 listening points (LPs) (see Figure 10.3, Stage 3 EIAR Volume 3) were included in the transects whereby surveyors observed bat activity at strategic points along transects recorded along the transect for a minimum of five minutes.

Static survey

- 2.1.6 Following the above activity surveys, a targeted static survey was undertaken in 2018. The survey adopted the suggested methodology outlined in the Bat Surveys Good Practice Guidelines (Ref (1)) and Bat Workers Manual (Ref (2)). It was undertaken within the optimum survey season (May to August).
- 2.1.7 An Anabat Express automated/static bat detector with an omni-directional microphone was used. The surveyors mounted the bat detector to a fence post where there was a gap in the tree canopy (see Figure 10.3, Stage 3 EIAR Volume 3). The detector's microphone was pointed towards the field and angled slightly upwards.

2.1.8 The bat detector was set to night only mode which meant that the detector was recording from thirty minutes before sunset to thirty minutes after sunrise.

2.1.9 Table 2 details when the automated/static bat detector was deployed/collected and the Amey surveyors present on each visit.

2.1.10 The data was analysed using AnalookW version 4.2g.

Table 2: Summary of Survey Visits

Date of Deployment/Collection	Surveyors	Comments
28/05/2018 - deployment	Lorna McRae (Ecologist GradCIEEM)	SIM card error, recordings not obtained
04/06/2018 - collection	Jennifer Reid (Ecologist)	
29/06/2018 - deployment	Jennifer Reid (Ecologist) Adam Kelly (Environmentalist)	No issues, recordings obtained
11/07/2018 - collection	Lorna McRae (Ecologist GradCIEEM) Stephannie Coomber (Environmentalist)	
01/08/2018 - deployment	Lorna McRae (Ecologist GradCIEEM) Adam Kelly (Environmentalist)	Faulty microphone, recordings not usable
06/08/2018 - collection	Lorna McRae (Ecologist GradCIEEM) Jennifer Reid (Ecologist)	
04/09/2018 - deployment	Lorna McRae (Ecologist GradCIEEM)	Faulty microphone, recordings not usable
11/09/2018 - collection	Jennifer Reid (Ecologist)	

Table 3 details the weather conditions during the survey period.

Table 3: Weather conditions during the static bat survey

Night of Survey	Date	Sunset Time	Sunrise Time	Cloud Cover	Wind	Precipitation	Temperature*
1	29/06/2018 to 30/06/2018	22:06	04:20	3%	8km/hr E, gusts	Dry	8.5 to 15.25°C
2	30/06/2018 to 01/07/2018	22:05	04:21	12%	9km/hr E, gusts	Dry	10.25 to 16.5°
3	01/07/2018 to 02/07/2018	22:05	04:22	6%	8km/hr ENE, gusts	Dry	11.25 to 17°C
4	02/07/2018 to 03/07/2018	22:04	04:23	17%	4km/hr ESE, light gusts	Dry	7.75 to 17.5°C
5	03/07/2018 to 04/07/2018	22:04	04:24	11%	4km/hr ESE, light gusts	Dry	10 to 19.5°C
6	04/07/2018 to 05/07/2018	22:03	04:25	21%	8km/hr SW, gusts	Dry	11.5 to 16.75°C
7	05/07/2018 to 06/07/2018	22:02	04:26	93%	9km/hr E, gusts	Dry	10 to 12.25°C

Night of Survey	Date	Sunset Time	Sunrise Time	Cloud Cover	Wind	Precipitation	Temperature*
8	06/07/2018 to 07/07/2018	22:01	04:27	8%	7km/hr ESE, gusts	Dry	9.75 to 14.75°C
9	07/07/2018 to 08/07/2018	22:00	04:29	12%	19km/hr WSW, gusts	Dry	11 to 18.25°C
10	08/07/2018 to 09/07/2018	21:59	04:30	100%	9km/hr E, gusts	0.4mm	11.75 to 14.75°C
11	09/07/2018 to 10/07/2018	21:58	04:31	64%	5km/hr ESE, light gusts	Dry	10 to 12.25°C
12	10/07/2018 to 11/07/2018	21:57	04:33	98%	5km/hr SE, light gusts	Dry	9.75 to 14.75°C

2.2. Breeding bird

- 2.2.1 The survey methodology employed was broadly based on the methods used for the British Trust for Ornithology (BTO) Breeding Bird Survey (Ref (4)) which included a walked transect of the survey area. Standard BTO species codes and symbols for bird activities were used to identify birds and denote activity. All bird species including notable species (Wildlife and Countryside Act (WCA) 81', Schedule 1, Red and Amber listed as Birds of Conservation Concern (BoCC) species and priority species (Section 2(4) of the Nature Conservation (Scotland)) Act 2004) were recorded throughout the survey.
- 2.2.2 To provide a reasonable level of accuracy for determining the population status of the breeding birds on the site, two transect surveys were undertaken (shown on Figures 10.4a and 10.4b in the Stage 3 EIAR, Volume 3). Each survey included four days, surveying between approximately 06:00 and 12:00. The first survey (early season) was undertaken on 21 April 2017 and 9-11 May 2017. The second survey (late season) was undertaken from 20-23 June 2017. These dates fall within the main breeding season between March and August. The surveys were undertaken by Michal Ostalowski (Ecologist - SLR Consulting) and assisted by Lorna McRae GradCIEEM (Ecologist).

Table 4: Weather conditions during breeding bird surveys

Date	Cloud cover (oktas)	Wind	Precipitation	Temperature (°C)
21/04/17	7	3	Light showers	-
09/05/17	0-8	2	None	6.5
10/05/17	8	2	None	5.6
11/05/17	8	3	None	6.3
20/06/17	7	3	None	9.6
21/06/17	8	2	None	13
22/06/17	8	3	Light showers	11.5
23/06/17	8	4	Drizzle/light showers	13.4

2.2.3 Birds were considered to be confirmed breeders if:

- They were observed displaying or singing on more than one visit
- Nests, eggs or young were identified
- Repeat alarm calls from adults were heard
- Distraction displays were seen
- Territorial disputes were observed.

2.2.4 Birds were considered to be possibly breeding if:

- They were observed displaying or singing on one visits (with exception of obvious passage migrants in spring)
- A pair of birds was observed in suitable habitat for nesting

2.2.5 Post-survey analysis determined approximate central locations of bird territories according to methods developed by Marchant (Ref (5)) and GIS mapping was used to digitise the information.

2.3. Wintering bird

2.3.1 The survey methodology employed was broadly based on the methods used for the BTO Winter Farmland Bird Survey (Ref (6)) which included a walked transect of the survey area. Standard BTO species codes were used to identify birds. All bird species including notable species (Wildlife and Countryside Act (WCA) 81', Schedule 1, Red and Amber listed as Birds of Conservation Concern (BoCC) species and priority species (Section 2(4) of the Nature Conservation (Scotland)) Act 2004) were recorded throughout the survey.

2.3.2 To provide a reasonable level of accuracy for determining the population status of the wintering birds on the site, three transect surveys were undertaken; although only two of these transects (Transect 2 (T2) and Transect 3 (T3)) are within the current study area for Stage 3. The transect routes are shown on Figures 10.5a to 10.5c of the Stage 3 EIA Volume 3. Each survey included three days, surveying between approximately 07:30 and 14:00. The first survey was undertaken on 16-18 January 2018. The second survey was undertaken from 13-15 February 2018. The third survey was undertaken on 13-15 March 2018. These dates fall within the winter season between October and March. The surveys were undertaken by Austin Morley (Ecologist) and assisted by Lorna McRae GradCIEEM (Ecologist), and Jennifer Reid (Assistant Ecologist), and the weather conditions during the surveys are given in Table 5.

Table 5: Weather conditions during wintering bird surveys

Date	Cloud cover (oktas)	Wind	Precipitation	Temperature (°C)
16.01.18	8	4	None	2
17.01.18	2/3	2	None	2
18.01.18	2	1	None	2
13.02.18	8	7	Drizzle/ light showers	4
14.02.18	7	5	None	4
15.02.18	4	6	None	5
13.03.18	5	2	None	7
14.03.18	5	2	None	6
15.03.18	7	2	None	7

2.4. Red squirrel

Hair tube survey

- 2.4.1 A hair tube survey was carried out to confirm red squirrel presence, hair tubes were set up on site on 28 July 2017 and the 04 August 2017, in accordance with Practical Techniques for Surveying and Monitoring Squirrels (Ref (7)). The survey locations are shown on Figure 10.6 of the Stage 3 EIAR, Volume 3.
- 2.4.2 Based on the findings of the PEA and previous records, six mixed woodland corridors were identified for the survey. A numbered hair tube (300mm length and 64mm x 65mm square ended) was placed (approximately every 100m) along each linear stretch of woodland. Each tube was then baited and the coordinates and trees species was recorded. A total of 23 hair tubes were placed throughout the six areas.
- 2.4.3 The hair tubes were checked after two weeks and were re-baited, due to limited signs of hairs and left for an extra week.
- 2.4.4 The hair tubes were then collected on 9 October 2017, with each hair sample being placed in a separate sealed bag (corresponding tube number). Each hair sample was analysed under a x400 microscope to establish whether it was red squirrel.

Drey count

- 2.4.5 The hair tube survey confirmed that red squirrel are present within the woodland along Gaugers Burn. Therefore, a drey count was undertaken to identify any dreys within the survey area. This was undertaken in accordance with surveying and monitoring guidance produced by the Forestry Commission, Surrey (Ref (7)).
- 2.4.6 This was undertaken with two surveyors walking approximately 20m apart and traversing through the mixed woodland adjacent to Gaugers Burn from east to west, and included the block of coniferous woodland at Johnston Lodge. Surveys were undertaken on 1 August and 4 September 2018, this was considered appropriate as the majority of the trees were coniferous, and therefore time of year is irrelevant.

2.5. Badger

- 2.5.1 At Stage 2, the Phase 1 habitat survey identified areas of suitable habitat to support badger (Ref (3)). The Stage 3 surveys included a species specific survey on 1 August and 4 September 2018 of the areas of suitable habitat that were within 50m of the proposed scheme, this predominantly included the area of woodland adjacent to Gaugers Burn and small areas of, grassland, road verges and ditches. Badger field signs are described by Harris S et al. Surveying Badgers (Ref (8)) and include:

- Setts:
 - Main sett – usually continuously used with many signs of activity around, a large number of holes and conspicuous spoil mounds.
 - Annex sett – usually located close to a main sett and connected to it by well used paths. Annex's may not be continuously occupied.
 - Subsidiary sett – lesser used setts comprising of a few holes and without associated well used paths. Less likely to be occupied.
 - Outlier sett – one or two holes without obvious paths. Sporadically used.
- Faeces: Usually deposited in excavated pits, often found in a concentration (latrine) along a territory boundary.
- Paths
- Scratching posts
- Snuffle holes
- Hairs (often caught on fencing/ tree roots)

- Footprints.

2.5.2 Following the identification of a badger sett (at NGR NO 71606 69984), a camera trap survey was undertaken to confirm absence/ likely absence. The trail camera was deployed between 4 September 2018 and 12 October 2018.

2.5.3 These surveys were undertaken by Lorna McRae GradCIEEM (Ecologist), Jennifer Reid (Assistant Ecologist) and Adam Kelly (Graduate Environmentalist).

2.6. Otter/ water vole

2.6.1 The PEA identified suitable habitat for water vole along the various watercourses and field drains (Appendix 10.1 of the Stage 3 EIAR).

2.6.2 The survey methodology followed best practice as recommended by The Water Vole Mitigation Handbook (Ref (9)). Surveys were undertaken 9 – 10 October 2017, 1 August 2018, 4 September 2018, and 28 March 2019. The weather prior to and during the survey work was suitable for surveys.

2.6.3 Surveys were carried out within the Gaugers Burn and an unnamed watercourse as described in section 1.2.7, and recorded all identified signs of potential water vole presence including:

- Faeces
- Latrines
- Burrows
- Runs
- Feeding stations
- Footprints

2.6.4 All accessible watercourses within the survey area were surveyed for otter field signs. Surveys were carried out in accordance with published methodologies including Ecology of the European Otter (Ref (10)). Otter signs include:

- Footprints
- Spraints
- Feeding remains
- Slides
- Couches
- Holts.

2.7. Aquatic invertebrates

2.7.1 A survey of aquatic invertebrates was undertaken in accordance with the guidelines set out in the Natural England Research Report NERR005; 'Surveying terrestrial and freshwater invertebrates for conservation evaluation' (Ref (11)).

2.7.2 Surveys were carried out on 12 June 2018 by suitably qualified ecologists; Mark Nelson MSc, Grad CIEEM and Jennifer Reid MSc, FGS. The sample points are shown on Figure 10.8 of the Stage 3 EIAR, Volume 3. Conditions on the day were calm and warm with intermittent sunshine. The water level was low but sufficient to sample adequately.

- 2.7.3 Kick sampling was carried out within the Gaugers Burn with one haul (sample) taken from between the Gaugers Bridge and the A90 bridge, and two hauls (samples) taken upstream of the A90 bridge between the A90 and Johnston Lodge.
- 2.7.4 Hauls were taken from microhabitats assessed as likely to be most productive, but including a mix of riffle, pools and vegetated sections. Each haul consisted of approximately 3 minutes of kick sampling using a pond net followed by a timed 10-minute sorting of the catch on the bank to collect samples. Priority was given to the recommended groups for sampling flowing water assemblages (Ref (11)); stoneflies *Plecoptera*, mayflies *Ephemeroptera* and caddis flies *Trichoptera*, with additionally water beetles *Coleoptera*. All samples collected were preserved and later identified to species level where possible, otherwise to taxon.
- 2.7.5 Species lists from each survey area were analysed using Pantheon (Ref (12)) to evaluate associated habitats and resources, assemblage types (adapted from the Invertebrate Species-habitat Information System [ISIS]), habitat fidelity scores and other information. Pantheon further assessed if the species list qualified as an Invertebrate Assemblage, and indicated the condition of any assemblage.
- 2.7.6 Samples were additionally analysed using SAFIS (Ref (13)), which combines scores from various aquatic sampling measures (Biological Monitoring Working Party BMWP, Average Score Per Taxon ASPT, Lincoln Quality Index LQI, Community Conservation Index CCI, Lotic-invertebrate Index for Flow evaluation LIFE and Proportion of Sediment-sensitive Invertebrates PSI) with other functions. This evaluates water quality, flow rate, water beetle fauna, sedimentation and community conservation value of samples.

3. Results

3.1. Bat

Activity surveys

3.1.1 Two species of bat were recorded during the survey:

- Common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *Pipistrellus pygmaeus*.

3.1.2 Bats were recorded along most linear features throughout the site, including tree lines, woodland edges and the railway line. The highest areas of bat activity were along the railway line (Figure 10.3, included in the Stage 3 EIA, Volume 3).

3.1.3 Typical emergence times for both species of pipistrelle is approximately 30 minutes after sunset (expected for an 'earlier emerging species'), likely indicating there are roosts close by.

3.1.4 Figure 10.3 (included in Volume 3 of the Stage 3 EIA) details the findings of the bat activity survey and highlights potential important flight corridors. Bat activity included foraging/commuting bats throughout the survey area. Areas of high activity included the railway line, woodland edges around Denlethen Wood, and Gaugers Burn.

Static surveys

3.1.5 In order of occurrence, starting with the most frequently recorded, the following bat species were recorded during the static bat survey:

- Common pipistrelle, soprano pipistrelle and *Myotis* sp.

3.1.6 A summary of each nights' bat activity is included in Table 6.

Table 6: Summary of bat activity per night

Date	Species	No. of Calls	Notes
29/06/2018 to 30/06/2018 (Night 1)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	146	First bat pass at 22:01, five minutes before sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	44	One <i>Pipistrellus</i> sp. social call was noted. Last bat pass was at 04:03, seventeen minutes before sunrise.
30/06/2018 to 01/07/2018 (Night 2)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	82	First bat pass at 22:08, three minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	23	Last bat pass was at 04:00, twenty-one minutes before sunrise.
	<i>Myotis</i> sp.	1	
01/07/2018 to 02/07/2018 (Night 3)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	315	First bat pass at 21:53, twelve minutes before sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	68	Last bat pass was at 03:52, thirty minutes before sunrise.
	Unidentified <i>Pipistrellus</i> sp.	12	
	<i>Myotis</i> sp.	7	
02/07/2018 to 03/07/2018 (Night 4)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	67	

Date	Species	No. of Calls	Notes
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	36	First bat pass at 22:23, nineteen minutes after sunset.
	Unidentified <i>Pipistrellus sp.</i>	1	
	<i>Myotis sp.</i>	1	Last bat pass was at 03:24, fifty-nine minutes before sunrise.
03/07/2018 to 04/07/2018 (Night 5)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	73	First bat pass at 22:37, thirty-three minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	6	Last bat pass was at 03:49, thirty-five minutes before sunrise.
	Unidentified <i>Pipistrellus sp.</i>	1	
04/07/2018 to 05/07/2018 (Night 6)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	96	First bat pass at 22:26, twenty-three minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	14	Two <i>Pipistrellus</i> social calls were recorded.
			Last bat pass was at 03:43, forty-two minutes before sunrise.
05/07/2018 to 06/07/2018 (Night 7)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	99	First bat pass at 22:18, sixteen minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	49	One <i>Pipistrellus social call</i> was recorded.
			Last bat pass was at 04:07, nineteen minutes before sunrise.
06/07/2018 to 07/07/2018 (Night 8)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	307	First bat pass at 22:29, twenty-eight minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	92	Last bat pass was at 03:52, thirty-five minutes before sunrise.
	Unidentified <i>Pipistrellus sp.</i>	2	
	<i>Myotis sp.</i>	2	
07/07/2018 to 08/07/2018 (Night 9)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	92	First bat pass at 22:34, thirty-four minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	15	Two <i>Pipistrellus social calls</i> were recorded.
	Unidentified <i>Pipistrellus sp.</i>	1	
	<i>Myotis sp.</i>	1	Last bat pass was at 03:54, thirty-five minutes before sunrise.
08/07/2018 to 09/07/2018 (Night 10)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	16	First bat pass at 23:16, one hour and seventeen minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	5	Last bat pass was at 03:46, forty-four minutes before sunrise.
	Unidentified <i>Pipistrellus sp.</i>	1	
09/07/2018 to 10/07/2018 (Night 11)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	108	First bat pass at 22:16, eighteen minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	21	

Date	Species	No. of Calls	Notes
	Unidentified <i>Pipistrellus sp.</i>	2	Some <i>Pipistrellus social calls</i> were recorded.
	<i>Myotis sp.</i>	1	Last bat pass was at 03:31, one hour before sunrise.
10/07/2018 to 11/07/2018 (Night 12)	Common pipistrelle <i>Pipistrellus pipistrellus</i>	96	First bat pass at 21:59, two minutes after sunset.
	Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	4	One <i>Pipistrellus social calls</i> were recorded.
	Unidentified <i>Pipistrellus sp.</i>	1	Last bat pass was at 03:51, forty-two minutes before sunrise.

- 3.1.7 First bat pass times vary significantly between five minutes before sunset, and one hour and seventeen minutes after sunset, the latter time thought to be influenced by the pattern of weather. Typically, *Pipistrellus* species emerge about twenty minutes after sunset. Given the early bat passes during the survey, there could potentially be a roost(s) near the survey location.
- 3.1.8 Occasional *Pipistrellus* social calls were recorded some nights during the survey. These are not thought to be associated with a roost at the survey location given the low occurrence of calls.

3.2. Breeding bird

- 3.2.1 A total of 28 bird species were identified as breeding within the survey area, none of which are protected under Schedule 1 of the Wildlife and Countryside Act 1981.
- 3.2.2 The surveys recorded a total of five BoCC Red species, five BoCC Amber species, 17 BoCC Green species, and one with no status. Five of the species are identified on the Scottish Biodiversity List, and six are UKBAP species. Table 7 details the species identified and the number of territories identified, this data is displayed in Figures 10.4a and 4b, included within the Stage 3 EIAR, Volume 3.

Table 7: Breeding bird survey results

BTO Species code	Common name	Scientific name	Count ¹	Conservation status
B.	Blackbird	<i>Turdus merula</i>	20	Green
BC	Blackcap	<i>Sylvia atricapilla</i>	8	Green
BF	Bullfinch	<i>Pyrrhula pyrrhula</i>	4	Amber
BT	Blue tit	<i>Cyanistes caeruleus</i>	19	Green
C.	Carrion crow	<i>Corvus corone</i>	5	Green
CC	Chiffchaff	<i>Phylloscopus collybita</i>	3	Green
CH	Chaffinch	<i>Fringilla coelebs</i>	60	Green
CT	Coal tit	<i>Periparus ater</i>	11	Green
D.	Dunnock	<i>Prunella modularis</i>	13	Amber
GT	Great tit	<i>Parus major</i>	20	Green
G.C	Goldfinch	<i>Carduelis carduelis</i>	8	Green
GO	Goldcrest	<i>Regulus regulus</i>	10	Green
HS	House sparrow	<i>Passer domesticus</i>	1	UK BAP, Red

¹ The count represents the number of each species thought to be holding a territory.

BTO Species code	Common name	Scientific name	Count ¹	Conservation status
PH	Pheasant	<i>Phasianus colchicus</i>	2	No status
R.	Robin	<i>Erithacus rebucula</i>	14	SBL, Green
RB	Reed Bunting	<i>Emberiza schoeniclus</i>	5	SBL, UK BAP, Amber
SG	Starling	<i>Sturnus vulgaris</i>	5	UK BAP, Red
SD	Stock dove	<i>Columba oenas</i>	1	Amber
SK	Siskin	<i>Carduelis spinus</i>	2	Green
S.	Skylark	<i>Alauda arvensis</i>	76	SBL, UK BAP, Red
SL	Swallow	<i>Hirundo rustica</i>	1	Green
ST	Song thrush	<i>Turdus philomelos</i>	12	SBL, UK BAP, Red
SW	Sedge warbler	<i>Acrocephalus schoenobaenus</i>	10	Green
WW	Willow warbler	<i>Phylloscopus trochilus</i>	27	Amber
WP	Wood pigeon	<i>Columba palumbus</i>	18	Green
WR	Wren	<i>Troglodytes troglodytes</i>	68	Green
WH	Whitethroat	<i>Sylvia communis</i>	28	Green
Y.	Yellowhammer	<i>Emberiza citrinella</i>	54	UK BAP, Red

3.3. Wintering bird

3.3.1 A total of 21 notable bird species (see Table 8) that are considered under the Birds of Conservation Concern 4 (Eaton et al, 2015), Schedule 1 Birds of the Wildlife & Countryside Act (1981) species lists were recorded during the survey. The results are shown on Figures 10.5a to 10.5b within the Stage 3 EIAR, Volume 3. 15 birds were classed as migrant/resident birds and five were classed as a passage/winter visitor. This does not meet any importance thresholds when using the criteria set out by Fuller (1980) as the site assemblage is less than 25 species.

3.3.2 The survey recorded a total of 11 BoCC Red species, nine BoCC Amber species and one BoCC Green species. 12 species are identified on the Scottish Biodiversity List, and eight are UKBAP species. Table 8 details the species identified and the number of each species observed. The following notable species and assemblages were identified:

- Two species are designated under Schedule 1; fieldfare *Turdus pilaris* and redwing *Turdus iliacus*.
- Eleven species are designated BoCC (2009) Red List; these included linnet *Carduelis cannabina*, skylark *Alauda arvensis*, yellowhammer *Emberiza citrinella*, song thrush *Turdus philomelos*, starling *Sturnus vulgaris* and herring gull *Larus argentatus* and tree sparrow *Passer montanus*.
- Nine species are listed on the BoCC (2009) Amber List; mallard *Anas platyrhynchos*, black headed gull *Chroicocephalus ridibundus*, common gull *Larus canus*, meadow pipit *Anthus pratensis*, house sparrow *Passer domesticus*, oystercatcher *Haematopus ostralegus*, pink-footed goose *Anser brachyrhynchus*, pintail *Anas acuta* and wigeon *Anas penelope*.
- Twelve species SBL; golden plover, black-headed gull, herring gull, linnet, house sparrow, grey partridge, redwing, starling, song thrush, tree sparrow,
- Seven UK BAP; house sparrow, skylark, yellowhammer, herring gull, song thrush, starling and linnet.

Table 8: Wintering bird survey results

BTO Species code	Common name	Scientific name	Count ²	Conservation status
BH	Black-headed gull	<i>Chroicocephalus ridibundus</i>	83	SBL, Amber
CM	Common gull	<i>Larus canus</i>	104	Amber
D.	Dunnock	<i>Prunella modularis</i>	13	Amber
FF	Fieldfare	<i>Turdus pilaris</i>	80	Schedule 1, Red
GP	Golden plover	<i>Pluvialis apricaria</i>	4	SBL, Green
HG	Herring gull	<i>Larus argentatus</i>	182	SBL, UKBAP, Red
HS	House sparrow	<i>Passer domesticus</i>	143	SBL, UKBAP, Red
LI	Linnet	<i>Carduelis cannabina</i>	85	SBL, Red
MA	Mallard	<i>Anas platyrhynchos</i>	19	Amber
MP	Meadow pipit	<i>Anthus pratensis</i>	32	Amber
OC	Oystercatcher	<i>Haematopus ostralegus</i>	3	Amber
P.	Grey partridge	<i>Perdix perdix</i>	4	SBL, UKBAP, Red
PG	Pink-footed goose	<i>Anser brachyrhynchus</i>	144	Amber
PT	Pintail	<i>Anas acuta</i>	1	Amber
RW	Redwing	<i>Turdus iliacus</i>	23	SBL, Schedule 1, Red
S.	Skylark	<i>Alauda arvensis</i>	86	SBL, UKBAP, Red
SG	Starling	<i>Sturnus vulgaris</i>	30	SBL, UKBAP, Red
ST	Song thrush	<i>Turdus philomelos</i>	9	SBL, UKBAP, Red
T.	Tree sparrow	<i>Passer montanus</i>	9	SBL, UKBAP, Red
WN	Wigeon	<i>Anas penelope</i>	1	Amber
Y.	Yellowhammer	<i>Emberiza citrinella</i>	75	SBL, UKBAP, Red

Species Accounts

Pintail

- 3.3.3 One individual was recorded on the 17 January 2018; this bird was observed on a small drainage pool on a farm off the A937 at the most westerly extent of the scheme. The pintail is an uncommon dabbling duck, which is most likely to be seen during the winter when it can be found with other ducks. Larger numbers gather on selected sheltered estuaries, but they can be found within inland lake and ponds.

Mallard

- 3.3.4 Mallard are a widespread and ubiquitous species of duck that inhabit a broad range of habitats across Aberdeen, their numbers increase in winter with an influx of birds from Iceland and continental Europe. Numbers of mallard will increase significantly in very cold weather. Mallard use a wide variety of food sources, both on land and in water which includes, invertebrates, seeds and agricultural plant material (Ref (14)). Mallard were observed on several occasions around the scheme with the largest numbers observed during T2 on small drainage pool on a farm off the A937 at the most westerly extent of the scheme.

Wigeon

- 3.3.5 One individual was recorded on the 14 January 2018; this bird was observed associating with 14 mallard on a small drainage pool on a farm off the A937 at the most westerly extent of T2. Found throughout the

² The count represents the number of each species thought to be holding a territory.

country in winter, with large numbers congregating in coastal areas. Wigeon breed in Scotland and Northern England in very small numbers.

Pink-footed Goose

- 3.3.6 No geese were recorded on the ground with observations of flocks of geese overhead. T2 on the 18 January 2018 has the largest group of 30 birds heading north east. Pink-footed geese are found only in Aberdeen during the winter and classed as passage winter visitors. Birds that nest in Greenland and Iceland spend the winter in Scotland, North West England and East Anglia.

Gulls

- 3.3.7 Herring gull appeared to be the most observed gull across all transect locations with birds passing over in flight and utilising the urban areas and arable areas for roosting and foraging. Herring gulls can be observed in the UK all year round particularly on inland sites such as farmland, however they have suffered moderate declines over the past 25 years and over half of their UK breeding sites are now confined to less than 10 sites (Ref (15)).
- 3.3.8 Common gull numbers were low, large counts were observed during the drive transect when a mixed flock of gulls roosted on the ground. This flock was recorded just outside of the 500m buffer area foraging in a recently ploughed field. However, the largest count of 70 birds was observed following a plough in an arable field along T2 on the 17 of January 2018.
- 3.3.9 Black-headed gull were numerous, with the largest count observed following a plough in an arable field along T2. This large flock was recorded just outside of the 500m buffer area foraging in a recently ploughed field on the 17 of January 2018.

Golden Plover

- 3.3.10 Golden plover observations were limited to a single record of four birds observed within a ploughed arable field close to the farm off the A937 at T2. Golden plover is a common, widespread and ubiquitous species and these records over a survey site that consists of large expanses of arable are not unexpected.

Oystercatcher

- 3.3.11 Oystercatchers were only recorded twice during the survey effort; one individual was observed within the Mearns Academy on the 15 March 2018 along T2 and a pair was recorded on the 13 March 2018 along T1 (outwith the current study area) close to the academy. Oystercatcher are known to be originally a coastal species, oystercatchers have moved further inland over the last 50 years to breed on waterways and lakes. Most UK birds still spend their winters by the sea, however, and are joined by birds from Norway and Iceland.

Starling

- 3.3.12 Starling was not widely recorded and only observed at T2 and T3, which was to be expected as both of these transects are near the urban areas. Starlings are known to congregate on lowland arable land and urban areas during the winter and are typically conspicuous and widespread in the UK, occurring everywhere except for the highest parts of the Scottish Highlands.

Sparrows

- 3.3.13 House sparrow was recorded on several occasions across the scheme location but their primary site was T1 at Burns Care Home and T2 at Cameron Roberts Farm off the A937 close to Mearns Academy. House sparrows are a nationally declining species with numbers down by 71% between 1977 and 2008. They can be found across towns and cities and are thinly spread throughout most of the countryside (Ref (16)).
- 3.3.14 Tree sparrow were less numerous and only found at one location along T1 (outwith the current study area) at a disused farm building and scrub area adjacent to the railway. Tree sparrow are birds primarily associated with farmland, hedgerows and woodland edges, and are not associated with urban areas in the way that the house sparrow is in the UK. Tree sparrow is scarcer in the upland areas, and the far north and west of the UK. The main populations are now found across the Midlands, southern and eastern England.

Dunnock

- 3.3.15 Dunnock were recorded across the scheme but were restricted to boundary edges, hedgerows and railway embankments.

Thrushes

- 3.3.16 Song thrushes were observed across the site in small numbers, single records were recorded along hedgerows at T1 and T2 and at T3 in Denlethen Woods. Song thrush can be found in the UK all year round but gather in larger numbers during autumn and winter; song thrush can be regularly observed on farmland and are nationally declining.
- 3.3.17 Fieldfare were sporadic across the site, many were observed feeding along the defunct hedgerows and hawthorn trees, however the largest gathering was observed along the woodland edge of Denlethen Woods at T3 on the 15 February 2018. Fieldfares are classed as passage winter visitor as they come to Aberdeen during the winter months.
- 3.3.18 Redwings are also classed as passage winter visitor as they come to Aberdeen during the winter months, these were regularly observed across the scheme location and the largest counts come from the 15 February 2018 along T3.

Larks and Pipits

- 3.3.19 Skylark and meadow pipits were widely recorded during this study with skylark being the more numerous of the two. The principal transect route for these species was T1. Both species will congregate at or on arable lowland during the autumn (Ref (17)) and this is the habitat where these species were recorded. Skylark are designated as a UK BAP Priority species.

Yellowhammer

- 3.3.20 Scarce across the county yellowhammer is a resident in most of the UK and Ireland; however, it is not as common in the north and west of Scotland. This species breeds in arable fields and grasslands and is also found in hedges, heaths, banks and commons (Ref (18)).
- 3.3.21 In the winter, it feeds in fields with fodder crops and joins mixed flocks of buntings and finches. The decline of yellowhammer is most likely a result of modern farming practices, autumn sowing of crops and the loss of winter stubble, which is affecting a wide range of farmland birds. It is a Priority Species in the UK Biodiversity Action Plan.

Linnet

- 3.3.22 Linnets were observed across the site, with the largest flock of 30 birds observed from T2 on the 15 February 2018, foraging on marginal vegetation of an arable field. Linnets are regular winter visitors to coastal sites and spend time on inland arable sites during their autumn passage and this record is notable but not significant due to the bird's abundance.

Grey Partridge

- 3.3.23 Grey partridge numbers remained low and were only observed twice during the survey effort; both records were observed in the same area along T1 on the 16 January and the 13 March 2018. Grey partridge are designated as a UK BAP Priority species.

3.4. Red squirrel

- 3.4.1 During hair tube surveys undertaken in 2018 there was one recorded red squirrel hair within the woodland at Gaugers Burn to the west of the existing A90, and no indication that they are present to the east of the A90.
- 3.4.2 There were no dreys or sightings recorded within these woodlands.

3.5. Badger

Generally, there was limited badger field signs identified within the entire survey area. Badger field signs are shown in Figure 10.7 within the Stage 3 EIAR, Volume 3. Most signs were localised to the woodland at Gaugers Burn, there were two outlier sett entrances (one active, one inactive), a bone (likely femur due to size and shape), a single guard hair, and an old latrine. There were badger footprints observed in the snow during other surveys on adjacent field boundaries.

The setts (Photograph 1) were considered to be outlier setts due to there only being one entrance, and some leaf litter covering the entrance. A trail camera was deployed at the sign that showed the most use (with a guard hair outside) for 30 days to determine the usage of the sett. During this time a badger was seen on one occasion investigating the entrance to the sett but was not seen entering/re-emerging.

Photograph 1: Badger at outlier sett



3.6. Otter/ water vole

- 3.6.1 The otter and water vole survey included two burns (Gaugers Burn and an unnamed burn), both flow from east to west and into Luther Water.
- 3.6.2 Otter are known to be on Luther Water – due to being observed in the water course in 2017 by Amey surveyors. There have been no signs that otter use either watercourse that have been surveyed.
- 3.6.3 There were no water vole field signs to indicate presence along Gaugers Burn or the unnamed burn. Brown rat and field vole signs were observed along both.

3.7. Aquatic invertebrates

Sample site 1, NGR NO7111970538

- 3.7.1 Observed to be a narrow stone bedded stream of approximately 0.5 to 1m wide. The earth embankments were vertical and approximately 0.5m high. The surrounding habitat was of tall ruderal vegetation with taller scrub in places; this meant the stream was shaded in places. The stream in this section comprised mainly riffles with a few pools; where these were present they were not deep.

Sample site 2, NGR NO7133070313

- 3.7.2 Observed to be a broad stone bedded stream of approximately 1m to 1.5m wide with extensive shingle in places. The banks were vertical and approximately 0.5m high. The surrounding habitat was short cut grassland. The stream in this section was meandering with riffles and several deeper pools with some vegetation overhanging from the bank; although vegetation within the stream was scarce.

Sample site 3, NGR NO7136370288

- 3.7.3 Observed to be a broad stone bedded stream of approximately 1m to 1.5m wide with extensive shingle in places. The banks were vertical and approximately 0.5m high. The surrounding habitat was short cut grassland. The stream in this section was meandering with riffles and several deeper pools with some vegetation overhanging from the bank; although vegetation within the stream was scarce.

Species

- 3.7.4 Surveys identified 82 individuals to species level, identifying 18 species of invertebrate (Table 9). Sample site 1 identified 23 individuals of 7 species. Sample site 2 identified 32 individuals of 10 species. Sample site 3 identified 27 individuals of 11 species. Two species, the medium olive *Baetis vernus* and blue winged olive *Serratella ignita*, were present at all sample sites. Six species were present at two sample sites, ten species occurred in only one sample site.
- 3.7.5 The survey identified eight species of mayfly *Ephemeroptera*, four species of stonefly *Plecoptera*, four species of beetle *Coloeptera* and two species of caddisfly *Trichoptera*.
- 3.7.6 Two species of conservation concern were collected during the sampling; the nationally threatened diving beetle *Oreodytes davisii*, and the pale watery mayfly *Baetis fuscatus* which is considered to be of data deficient status.

Table 9. Species collected during sampling (all samples)

Species	Common Name	Number	Order	Status	Habitat if known	Notes on this species
<i>Baetis vernus</i>	Medium Olive	20	Ephemeroptera	Common	Slow flow rivers, upper reaches of small stony streams	Common in England and Wales but a highly localised distribution in Scotland
<i>Serratella ignita</i>	Blue Winged Olive	28	Ephemeroptera	Common & Widespread	Swift running waters, upland lake shores	One of the most common and widespread species
<i>Isoperla grammica</i>	Common Yellow Sally	2	Plecoptera	Common	Rivers & still waters	Very common, very abundant.
<i>Leuctra moselyi</i>	Mosely's needle fly	2	Plecoptera	Unknown	Small stony streams	Rare but abundant. No complete distribution due to difficulties of identification.
<i>Baetis fuscatus</i>	Pale Watery	3	Ephemeroptera	Unknown	Riffle areas of rivers & streams	No complete distribution due to difficulties of identification.
<i>Ecdyonurus venosus</i>	Late March Brown	3	Ephemeroptera	Common	Stony rivers & streams	No complete distribution due to difficulties of identification.
<i>Oreodytes davisii</i>	A Lesser Diving Beetle	1	Coleoptera	Nb	rocky streams	Widespread in North England and mainland Scotland; frequent.
<i>Dipterona felix</i>	A caseless caddis 'The Grey Flag' or 'Marbelled Sedge'	2	Trichoptera	Common	Particularly springs & small woodland streams which are cool in summer	Common and abundant
<i>Wormaldia occipitalis</i>	A caseless caddis	1	Trichoptera	Common (Nr in SE & E Anglia)	Small streams, large spring fed trickles	Common and abundant
<i>Siphonurus lacustris</i>	Summer Mayfly	5	Ephemeroptera	Occasional	Rivers, streams & high altitude pools	Occurs in localised pockets throughout the British Isles

Species	Common Name	Number	Order	Status	Habitat if known	Notes on this species
<i>Electrogena lateralis</i>	Dusky Yellowstreak	5	Ephemeroptera	Common	Riffle areas of running waters, or wave washed lake shores	Common, though localised species.
<i>Perla bipunctata</i>	Large pale stonefly	1	Plecoptera	Common	Rivers	Common and abundant
<i>Siphonoperla torrentium</i>	Common small yellow sally	1	Plecoptera	Common	Rivers & still waters	Very common, very abundant.
<i>Ecdyonurus insignis</i>	Large Green Dun	1	Ephemeroptera	Unknown	Stony rivers	Highly localised species with records from a small number of watercourses in England and Scotland.
<i>Procladius bifidum</i>	Pale Evening Dun	3	Ephemeroptera	Unknown	Slow flow streams & rivers	Found throughout the British Isles, though appears to have a very localised distribution.
<i>Helophorus grandis</i>	A Mud Beetle	1	Coleoptera	Common	Shallow streams, grassy pools and ditches	Very common and abundant
<i>Platambus maculatus</i>	A Lesser Diving Beetle	1	Coleoptera	Common	Running water and wave-washed lakes	Widespread in Britain north to Caithness but scarce.
<i>Hydroporus nigrita</i>	A Lesser Diving Beetle	2	Coleoptera	Common	ponds, ditches, Sphagnum	Very common in North England and Southern Scotland, widespread elsewhere; frequent

Pantheon

- 3.7.7 Pantheon analysis shows all species are associated with the broad wetland biotope, and sixteen associated with running water (Table 10). No species were associated with a Specific Assemblage Type (SAT).

Table 10 Pantheon habitats

Broad biotope	Habitat	Resource	No. of species	% representation
wetland	running water	flow >> fast	9	9
wetland	running water	unmodified fast flowing streams	8	4
wetland	running water	flow >> slow	3	2
wetland	marshland	shallow freshwater pond	1	<1
wetland	peatland	shallow freshwater pond	1	<1
wetland	peatland	shallow freshwater pond >> aquatic: sparsely vegetated	1	2

Site Analysis for Freshwater Invertebrate Surveys

- 3.7.8 Site Analysis for Freshwater Invertebrate Surveys (SAFIS) analysis produces a Biological Monitoring Working Party score indicating very good water quality. The Lincoln Quality Index score (for water and habitat quality) indicates excellent quality. Wetscore indicates a poor water beetle fauna and the Community Conservation Index indicates very high conservation value. The Lotic-invertebrate Index for Flow Evaluation indicates very fast flow, and the Proportion of Sediment-sensitive Invertebrates score indicates the site area bed surface is minimally or un-sedimented with 78% of the species found being sensitive to sedimentation, and 22% being insensitive to sedimentation (Table 11).
- 3.7.9 There was minor variation in scores between sampling sites. Sample site 1 showed a BMWP score indicating moderate water quality (BMWP 49, ASPT 8.17; revised BMWP 48.2, ASPT 8.03), but very fast flow (LIFE 8.57) and a PSI of 100% of species sensitive to sedimentation (PSI 100). Sample site 3 showed LIFE of fast flow (7.44), and PSI showing the site bed surface to be slightly sedimented (PSI 70.59, 64% of species sensitive to sedimentation).

4. Summary & Conclusions

4.1. Bat

- 4.1.1 There have been no potential roosts identified within the survey area.
- 4.1.2 The activity surveys have confirmed the presence of bats within the scheme area, including a large amount of pipistrelle activity at the static survey location on the woodland edge near Gaugers Burn.
- 4.1.3 The static survey confirmed that the woodland edge near Gaugers Burn is highly used by pipistrelle species (both common and soprano), with up to 315 common pipistrelles being recorded on a single night.

4.2. Breeding birds

- 4.2.1 Bird territories were recorded in field boundaries, woodland and open arable farmland habitats. Generally, the species recorded are unlikely to be reliant on habitats within the survey area due to these habitats being very common within the wider landscape.
- 4.2.2 Most species recorded are considered to be of site or local importance due to being a common widespread species throughout the region and/or UK. Populations of house sparrow, skylark and yellowhammer may be important at a county level due to their declining populations, and identification as a red list species.

4.3. Wintering bird

- 4.3.1 Bird activity was generally concentrated along field boundaries, where trees and hedgerows were present and these habitats are suitable for a range of winter passage birds. The stubble fields will likely support flocks of farmland bird species such as starling, yellowhammer and skylark in the winter, depending on how the fields are managed. The named passage/winter species appeared to use the study area in relatively small numbers. In general, the species recorded were considered unlikely to be reliant exclusively on habitats within the study area. Waterfowl were generally recorded infrequently and in low numbers.
- 4.3.2 In conclusion, the numbers and species of birds recorded within the study area were generally typical of the habitats present both in the study area and the wider area. The number of birds identified within the study area throughout the survey period was not considered to represent a significant proportion of the populations of winter qualifying or for wintering populations for the UK (British Trust for Ornithology, 2016). In general, the species observed were unlikely to be solely reliant on habitats within the study area. Overall, wintering birds are therefore considered to be of local importance.

4.4. Red squirrel

- 4.4.1 Red squirrel have been recorded (although infrequent) using the woodland along Gaugers Burn but are not considered to use the area east of the A90.

4.5. Badger

- 4.5.1 Badger have been confirmed to be active within the wider landscape, but have not been confirmed to have an active sett within the survey area.

4.6. Otter

- 4.6.1 There have been no field signs to indicate that otter are active along Gaugers Burn or the unnamed Burn. They are considered to likely be active on Luther Water based on previous observations, despite no dedicated surveys along that watercourse.

4.7. Water vole

- 4.7.1 There have been no field signs to indicate that water vole are present along Gaugers Burn or the unnamed Burn.

4.8. Aquatic invertebrates

Habitats

- 4.8.1 Gaugers Burn contains pools and riffles, shingle and earth banks, open and shaded stretches; this creates a varied structure likely to support a rich and varied invertebrate fauna.
- 4.8.2 SAFIS indicates very good (BMWP) or excellent (Lincoln Index) water and habitat quality, with predominantly very fast flowing water (LIFE). Sufficient backwaters and eddies were present to form pools, offering habitat for species more characteristic of slower flowing water. At time of survey the water level appeared low; the lack of vegetation on the shingle banks suggest it is subject to periodic higher water levels of fast flow. The high quality of the water would likely make the habitat highly vulnerable to pollution.
- 4.8.3 Surrounding habitats offer taller vegetation and trees for emergence / shelter and the shorter vegetation, exposed shingle / sediment and bare patches offer locations for basking. The irregular course of the stream creates wider sections, deep / shallow margins and collapsed banks which offer a range of microclimates and habitats for the use of aquatic invertebrates in their terrestrial phases.

Species

- 4.8.4 Surveys resulted in two species of conservation concern being identified. The nationally threatened diving beetle *Oreodytes davisii* is widespread in mainland Scotland and can be frequent where it occurs, normally in rocky streams. The distribution of the Data Deficient pale watery mayfly *Baetis fuscatus* is currently not known due to difficulties in identifying to species, but is typically found in riffle areas of rivers and streams.
- 4.8.5 The site scores low for water beetle fauna (Wetscore) suggesting this is not an important site for water beetle assemblages, although it did include the notable water beetle *Oreodytes davisii*.
- 4.8.6 The site scores very high for conservation value (CCI), potentially of national significance. This is due to the high diversity of species rather than the rarity of those species although, in addition to the two species of conservation concern, several species found are of restrictive or unknown distribution and abundance. Many are also species associated with more restricted and uncommon habitats.
- 4.8.7 No species is associated with a SAT and therefore it is considered unlikely that an assemblage of a type characterised by ecologically restricted species is present within the stream itself. It is however possible that specific assemblage types for stream and river margin or shingle banks are present: these are dominated by terrestrial or semi-aquatic species which would be unlikely to be picked up by this survey.
- 4.8.8 78% of species sampled are highly sensitive to sedimentation (PSI). This suggests that this assemblage is likely to be vulnerable to soil disturbance and sediment runoff from any construction activities, or other measures likely to change the current flow of the stream.

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