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Cairnmore Hill Wind Farm

National Vegetation Classification & Habitats Survey Report

Technical Appendix 7.1

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Tel: 0141 342 5404

Web: www.macarthurgreen.com

Address: 93 South Woodside Road |Glasgow | G20 6NT

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1 INTRODUCTION

MacArthur Green was commissioned by RES Ltd ('the Applicant'), to review existing habitat data collected in 2014, and to undertake supplementary National Vegetation Classification (NVC) and habitats surveys, for the proposed Cairnmore Hill Wind Farm (hereafter referred to as 'the Proposed Development').

This report was previously submitted in support of the Ecological Impact Assessment for Cairnmore Hill Wind Farm original planning application (2019). It has been updated to reflect the updated design of the Proposed Development.

The scope and aims of the survey were two-fold:

- Conduct a walkover of the areas surveyed in 2014 by Caledonian Conservation Ltd (refer to Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm) and verify the habitats and communities recorded, adding further resolution to the mapping as necessary, making updates to vegetation communities and classification if required, and collecting further information on the character and quality of the habitats present via additional target notes and photographs; and
- Survey additional areas of the site not covered by the original surveys to identify and map the vegetation communities present and to account for layout and NVC study area changes (including associated buffers) resulting from the evolution of the design and site layout since initial surveys.

The NVC and habitats data are used to identify those areas of greatest ecological interest (i.e., Annex I habitats[1]; potential Groundwater Dependent Terrestrial Ecosystems (GWDTE)[2]; and Scottish Biodiversity List (SBL) priority habitats[3]).

This report details the findings of the walkover survey and additional NVC and habitats surveys together with an evaluation of those communities recorded.

1 THE SITE AND STUDY AREA

The Proposed Development site ('the site') is for up to five turbines and associated infrastructure. The site covers an area of approximately 3.58 km^2 located approximately 4.5 km northwest of Thurso on the north coast of Caithness in the Scottish Highlands.

The site is low lying and gently undulating, with its highest points lying just over 140 m above sea level in the northeast of the site by Ravens Hill and 138 m above sea level at Hill of Forss within the centre of the site; Cairnmore Hillock reaches 134 m to the west of the site. The southern central area of the site is a level plateau of relatively shallow peatland extending over Lythmore Moss, which is characterised by heavily grazed and degraded wet heath and wet modified bog. From the central area and towards the outer edges of the site the ground generally gently slopes away, and the habitats give way to mineral soils and semi-improved acid grasslands, improved pasture and fields ploughed for arable use; there are also some patches of marsh/marshy grassland throughout. There is no woodland within the site, although some small patches of *Ulex europaeus* (gorse) scrub are present. Several widespread minor watercourses drain the site.

The site does not overlap with any designated sites containing habitat related or botanical qualifying features. However, there are six designated sites within 5 km of the site with botanical/habitat qualifying features, as per Table 2-1; see also Figure 7.1.

Table 2-1 Designated sites with botanical qualifying features within 5 km of the site

Designated Site	Distance from site	Qualifying Feature	Last Assessed Condition & Date
Newlands of Geise Mire SSSI	1,456 m	Valley fen	Favourable Maintained 08/08/2012
Holborn Head SSSI	1,850 m	Maritime cliff	Favourable Maintained 05/09/2006
Westfield Bridge SSSI	3,077 m	Fen meadow Lowland calcareous grassland	Favourable Maintained 07/08/2003 Unfavourable Declining 20/06/2013
Loch Lieurary SSSI	2,526 m	Basin fen	Favourable Maintained 14/08/2008
Ushat Head SSSI	2,151 m	Maritime cliff	Favourable Maintained 14/08/2006
River Thurso SSSI	3,415 m	Floodplain fen Vascular plant assemblage	Unfavourable No change 29/05/2008 Favourable Maintained 02/07/2014

There are two small areas of woodland within 5 km of the site which are listed on the Ancient Woodland Inventory (AWI). These are located 860 m west of the site by Bridge of Forss and 4,582 m east of the site as per Figure 7.1.

The NVC study area includes the majority of the site area and buffers as appropriate to ensure sufficient areas were surveyed, for instance to account for the presence of potential GWDTE (100 m and 250 m buffers required as a minimum (SEPA, 2017a & b)). The NVC study area covered a total of 501.76 hectares (ha), as shown on Figure 7.2.

2 METHODOLOGY

The walkover survey and additional NVC surveys were carried out by a suitably qualified and experienced botanical surveyor using the NVC scheme (Rodwell, 1991-2000; 5 volumes) and in accordance with NVC survey guidelines (Rodwell, 2006). The NVC scheme provides a standardised system for classifying and mapping semi-natural habitats and ensures that surveys are carried out to a consistent level of detail and accuracy.

[1] As defined by the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora – the 'Habitats Directive'

[2] As defined within SEPA (2017). Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Available for download from http://www.sepa.org.uk/media/143868/lupsgu31_planning_guidance_on_groundwater_abstractions.pdf.

[3] https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy/scottish-biodiversity-list

Homogeneous stands and mosaics of vegetation were identified and mapped by eye and drawn as polygons on high resolution aerial imagery field maps. These polygons were surveyed qualitatively to record dominant and constant species, sub-dominant species and other notable species present. The surveyor worked progressively across the study area to ensure full coverage was achieved, and that mapping was accurate. NVC communities were attributed to the mapped polygons using surveyor experience and matching field data against published floristic tables (Rodwell, 1991-2000). Stands were classified to sub-community level where possible, although in many cases the vegetation was mapped to community level only because the vegetation was too species-poor or patches were too small to allow meaningful sub-community determination; or because some areas exhibited features or fine-scale patterns of two or more sub-communities.

Quadrat sampling was not used in this survey because experienced NVC surveyors do not necessarily need to record quadrats in order to reliably identify NVC communities and sub-communities (Rodwell, 2006). Notes were made about the structure and flora of larger areas of vegetation in many places (such as the abundance and frequency of species, and in some cases condition and evident anthropogenic impacts). It can be better to record several larger scale qualitative samples than one or two smaller quantitative samples; furthermore, qualitative information from several sample locations can be vital for understanding the dynamics and trends in local (study area) vegetation patterns (Rodwell, 2006).

Due to small scale vegetation and habitat variability and numerous zones of habitat transitional between similar NVC communities, many polygons represent complex mosaics of two or more NVC communities. Where polygons have been mapped as mosaics, an approximate percentage cover of each NVC community within the polygon is given so that the dominant community and character of the vegetation could still be ascertained.

Botanical nomenclature in this report follows that of Stace (2019) for vascular plants, Atherton *et al* (2010) for bryophytes and Purvis *et al* (1992) for lichens.

3 SURVEY DETAILS & CONSTRAINTS

The initial habitat surveys carried out by Caledonian Conservation Ltd were conducted in July and August 2014, details of which are provided in Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm.

The verification walkover survey and additional NVC and habitat surveys conducted by MacArthur Green were carried out from 27th to 29th August 2018 inclusive; a further small additional area was surveyed on 5th and 6th March 2019. It is recognised that the surveys in March 2019 are not in the optimal period for vegetation surveys, however the area surveyed was a small extension of areas already mapped and familiar to the surveyor with all communities still readily identifiable, as such the timing of the survey was not considered a limitation. The entire study area was accessible and there were no access restrictions.

The NVC system does not cover all possible semi-natural vegetation or habitat types that may be found. Since the NVC was adopted for use in Britain in the 1980s, further survey work and an increased knowledge of vegetation communities has led to additional communities being described that do not fall within the NVC system, particularly under-described vegetation communities of remote areas. Where such communities are found and recorded, they are given a non-NVC community code and are described.

It should be noted that the results from this survey, and the matches made in describing communities, represent a current community evaluation at the time of survey (as opposed to one seeking to describe what the community was before any human interference, or what it might become in the future). In light of this, a clear constraint of the vegetation survey and evaluation process as used in this and other surveys is that it offers only a snapshot of the vegetation communities present and should not be interpreted as a static long-term reference.

Ecological surveys are limited by factors which affect the presence of plants such as the time of year and weather. The ecological surveys undertaken to support the Proposed Development have not therefore produced a complete list of plants, and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, the results of these surveys have been reviewed and are considered to be sufficient to undertake the assessment.

4 NVC & HABITAT SURVEY RESULTS

The walkover verification survey of the 2014 data resulted in some minor updates to the vegetation classification and descriptions of the vegetation and habitats present and described within Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. The survey found the habitats at the site had not notably changed in type, extent or quality since the original 2014 survey, and that those survey results were still valid. Most updates to the existing data were minor changes to refine mapped boundaries, segregation of larger areas into smaller mapping units to provide more detail where necessary and reduce the number of large mosaic areas, and collecting additional target notes on species assemblages and habitat quality.

The additional surveys carried out in 2018 and 2019 recorded a similar set of communities and habitats as previously found, and of the same general quality. Several additional target notes were also taken in the newly surveyed areas to characterise the habitats further.

Overall, the categories of vegetation within the NVC study area includes the following 25 NVC communities recorded during the survey:

- Mires and flushes: M1, M2, M4, M6, M10, M17, M19, M23, M25;
- Wet heaths: M15;
- Dry heaths: H9, H10;
- Calcifugous grassland: U4, U5;
- Mesotrophic grassland: MG1, MG5, MG6, MG10;
- Calcicolous grassland: CG10;
- Woodland and scrub: W24;
- Swamp and tall-herb fens: S9, S10, S27; and
- Open habitat communities: OV25, OV27.

A number of non-NVC vegetation types or features were also mapped during both surveys carried out in 2018 and 2019. These were classified as follows (codes used are given in parentheses):

- Non-NVC small sedge mire (SSM);
- Non-NVC *Potentilla palustris* swamp (Svar);
- Non-NVC *Eriophorum angustifolium - Schoenus nigricans* mire (Mvar);

- Non-NVC wet *Carex nigra* mire (Cn);
- Non-NVC *Menyanthes trifoliata* bog pool community (Mt);
- *Juncus effusus* acid grassland community (Je);
- Bare ground, rock, tracks, disused quarry etc (BG);
- Recently ploughed fields/arable (AR);
- Buildings and associated outbuildings (BD);
- Private gardens/amenity grassland (PG); and
- Standing water (SW).

The main habitats at the site and their respective species assemblages and composition are described within Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. Given that the habitats at the site have not changed since the 2014 survey and the newly mapped areas generally recorded the same communities, the habitat descriptions provided in Technical Appendix 7.4, remain relevant and provide an overview of the habitats present. Therefore, detailed habitat descriptions are not repeated here, and reference should be made to Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm for details and descriptions. The NVC survey results are provided in Figure 7.2.

The vegetation types and habitats recorded during surveys were also correlated to their generally broader Phase 1 habitat classification equivalents (JNCC, 2010) for this study area, considering the species composition and habitat quality. For instance, typical blanket bog (E1.6.1) communities such as M17 have been classified here as wet modified bog (E1.7) due to the nature of the degraded mire which has been impacted by a long history of overgrazing, drainage and burning (e.g. refer to descriptions within Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm and target notes in Annex A).

The refined and combined habitat survey results for the NVC study area are displayed in Figure 7.2, which also displays the mapping results with the broad Phase 1 categories using standard Phase 1 habitats classification shading (JNCC, 2010). As noted above, the broad Phase 1 results have been interpreted from field surveys, mapping data, and the NVC polygon data. Polygons where there are mosaic NVC communities have in most cases been assigned a single Phase 1 classification based on the dominant NVC type (despite many polygons containing multiple Phase 1 types, often in low percentages). Therefore, whilst Figure 7.2 provides a broad overview, the NVC data should be consulted for further detail in a specific area if required.

As noted above, target notes were also made during surveys, often to pinpoint areas or species of interest, or provide further detail on the character or quality of the habitat. Target notes collected in the 2014 survey were added to the target notes collected in the 2018 and 2019 surveys to provide a single list of target notes, these are provided in Annex A below; Figure 7.2 also displays the locations of all target notes recorded. Photographs of several of the typical habitat types found within the study area are provided within Annex B.

Table 5-1 below details the extent of each Phase 1 habitat type, or community, recorded within the NVC study area during the baseline habitat mapping surveys.

Table 5-1 Phase 1 habitat/NVC community types and their extent within the NVC study area

Phase 1 Habitat Type	NVC/Habitat Type	Representative Area (Ha)	% of study area
A2.1 Scrub: dense/continuous	W23	5.19	1.03
B1.1 Acid grassland: unimproved	U4, U4b	36.01	7.18
	U5, U5c	19.62	3.91
B2.1 Neutral grassland: unimproved	MG1	7.00	1.40
B2.2 Neutral grassland: semi-improved	MG5	3.68	0.73
	MG10, MG10a	9.37	1.87
B3.1 Calcareous grassland: unimproved	CG10	0.09	0.02
B4 Improved grassland	MG6	96.42	19.22
B5 Marsh/marshy grassland	M23	24.31	4.85
	M23b	0.40	0.08
	M25b	0.05	0.01
	SSM	24.98	4.98
	Cn	0.20	0.04
	Je	0.91	0.18
C3.1 Tall herb & fern – tall ruderal	OV25	0.02	0.003
	OV27	0.30	0.06
D1.1 Dry dwarf shrub heath - acid	H9	8.94	1.78
	H10	1.70	0.34
D2 Wet dwarf shrub heath	M15, M15a, M15b, M15c, M15d	181.37	36.15
	Mvar	11.08	2.21
E1.7 Wet modified bog	M17, M17b	18.35	3.66
	M19	0.30	0.06
E2.1 Flush/spring: acid/neutral	M4	0.74	0.15
	M6	2.39	0.48
E2.2 Flush/spring: basic	M10	0.06	0.01
F1 Swamp	S9	0.19	0.04
	S10	0.02	0.004
	S27	1.21	0.24
	Svar	0.06	0.01
G1.4 Standing water - dystrophic	M1	0.09	0.02
	M2	0.13	0.03

Phase 1 Habitat Type	NVC/Habitat Type	Representative Area (Ha)	% of study area
	Mt	0.29	0.06
	SW	0.04	0.01
J1.1 Arable	AR	38.84	7.74
J1.2 Amenity grassland	PG	0.19	0.04
J3.6 Buildings	BD	0.33	0.07
J4 Bare ground	BG	6.87	1.37
	Total Area	**501.76**	**100**

5 EVALUATION OF BOTANICAL INTEREST

5.1 Overview

NVC communities can be compared with a number of habitat classifications in order to help in the assessment of the sensitivity and conservation interest of certain areas. The following sections compare the survey results and the communities identified against three classifications:

- Scottish Environment Protection Agency (SEPA) guidance on GWDTEs;
- Habitats Directive (92/43/EEC) Annex I habitats; and
- SBL Priority Habitats.

5.2 Groundwater Dependent Terrestrial Ecosystems (GWDTE)

SEPA has classified a number of NVC communities as potentially dependent on groundwater (SEPA, 2017a; 2017b). Wetlands or habitats containing these NVC communities are to be considered potential GWDTE unless further information can be provided to demonstrate this is not the case. Many of the NVC communities on the list are very common habitat types across Scotland, and some are otherwise generally of low ecological value. Furthermore, some of the NVC communities may be considered GWDTEs only in certain hydrogeological settings.

Designation as a potential GWDTE does not therefore infer an intrinsic biodiversity value, and GWDTE status has not been used as criteria to determine a particular habitats respective conservation importance. There is however a statutory requirement to consider GWDTEs, and the data gathered during the NVC surveys has been used to aid this assessment (refer to Annex C).

Using SEPA's (2017a; 2017b) guidance, Table 6-1 shows which communities recorded within the study area may be considered potentially GWDTE. Those communities which may have limited (moderate) dependency on groundwater in certain settings are marked in yellow and NVC communities recorded that are likely to be considered highly dependent, or sensitive GWDTE in certain hydrogeological settings are highlighted in red.

For the non-NVC wetland communities or habitat types recorded within the study area, an assessment has been made on their likely potential groundwater dependency based on botanical features, species assemblages, similarity to other closely related NVC communities, and the information provided in Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. Those non-NVC wetland types considered to be potential GWDTE are also included within Table 6-1.

Table 6-1 NVC communities within the NVC study area which may potentially be classified as GWDTE

NVC/Community Code	NVC/Community Name
M15	*Trichophorum germanicum – Erica tetralix* wet heath
M25	*Molinia caerulea – Potentilla erecta* mire
MG10	*Holcus lanatus - Juncus effusus* rush-pasture
S27	*Carex rostrata - Potentilla palustris* tall-herb fen
SSM	Small sedge mire
Mvar	*Eriophorum angustifolium - Schoenus nigricans* mire
Je	*Juncus effusus* acid grassland community
M6	*Carex echinata – Sphagnum fallax/denticulatum* mire
M10	*Carex dioica - Pinguicula vulgaris mire*
M23	*Juncus effusus/acutiflorus – Galium palustre* rush pasture
CG10	*Festuca ovina – Agrostis capillaris – Thymus praecox* grassland[4]

The location and extent of all identified potential GWDTEs are provided on an appropriate map; see Figure 7.3.

Within Figure 7.3 the potential groundwater dependency of each polygon containing a potential GWDTE is classified on a four-tier approach as follows:

- 'Highly – dominant' where potential high GWDTE(s) dominate the polygon;
- 'Highly - sub-dominant' where potential high GWDTE(s) make up a sub-dominant percentage cover of the polygon;
- 'Moderately – dominant' where potential moderate GWDTE(s) dominate the polygon and no potential high GWDTEs are present; and
- 'Moderately - sub-dominant' where potential moderate GWDTE(s) make up a sub-dominant percentage cover of the polygon and no potential high GWDTEs are present.

Where a potential high GWDTE exists in a polygon it outranks any potential moderate GWDTE communities within that same polygon.

GWDTE sensitivity has been assigned solely on the SEPA listings (SEPA, 2017a; 2017b). However, depending on several factors such as geology, superficial geology, presence of peat and topography, many of the potential GWDTE communities recorded may in fact be only partially groundwater fed or not dependant on groundwater. Determining the actual groundwater dependency of particular areas or habitat requires further assessment (refer to Annex C).

[4] When not on limestone.

5.3 Annex I Habitats

5.3.1 Overview

A number of NVC communities can also correlate to various Annex I habitat types. However, the fact that an NVC community can be attributed to an Annex I habitat type does not necessarily mean all instances of that NVC community constitute Annex I habitat. Its Annex I status can depend on various factors such as quality, extent, species assemblages, geographical setting and substrates.

Using Joint Nature Conservation Committee (JNCC) Annex I habitat listings and descriptions[5], which have then been compared with survey results and field observations, the following NVC and non-NVC communities within the study area which may constitute Annex I habitat are shown in Table 6-2.

Further details on the inclusion or omission of certain NVC communities/sub-communities and/or Annex I habitat types are also provided below.

Table 6-2 NVC communities recorded and corresponding Annex I habitat types

NVC Code	NVC Community Name	Annex I Code	Annex I Title
M4	*Carex rostrata - Sphagnum fallax* mire	7140	Transition mires and quaking bogs
M10	*Carex dioica – Pinguicula vulgaris* mire	7230	Alkaline fens
M15	*Trichophorum germanicum – Erica tetralix* wet heath	4010	Northern Atlantic wet heaths with *Erica tetralix*
Mvar	*Eriophorum angustifolium - Schoenus nigricans* mire	4010	Northern Atlantic wet heaths with *Erica tetralix*
SSM	Small sedge mire	4010	Northern Atlantic wet heaths with *Erica tetralix*
M17	*Trichophorum germanicum – Eriophorum vaginatum* blanket mire	7130	Blanket bog
M19	*Calluna vulgaris – Eriophorum vaginatum* blanket mire	7130	Blanket bog
H9	*Calluna vulgaris – Deschampsia flexuosa* heath	4030	European dry heaths
H10	*Calluna vulgaris - Erica cinerea* heath	4030	European dry heaths

5.3.2 7140 Transition mires and quaking bogs

All examples of M4 *Carex rostrata - Sphagnum fallax* mire within the study area were assigned to the Annex I type Transition mires and quaking bogs. The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is intermediate between acid bog and alkaline fen.

5.3.3 7230 Alkaline fens

Alkaline fens consist of a complex assemblage of vegetation types characteristic of sites where there is tufa and/or peat formation with an elevated water table and a calcareous base-rich water supply. The core vegetation is short sedge mire. Examples of M10 mire in the study area fall within this Annex I habitat type.

5.3.4 4010 Northern Atlantic wet heaths with Erica tetralix

Wet heath usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. The vegetation is typically dominated by mixtures of *Erica tetralix*, *Calluna vulgaris*, grasses, sedges and *Sphagnum* bog-mosses. All examples of M15 wet heath were included within the 4010 Northern Atlantic wet heaths category. However, it should be noted the wet heath within the study area is a degraded from that has resulted from a long history of over-grazing, drainage and burning (refer to Annexes A and B below).

Additionally, as stated within Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014, it is also recommended that, as a precaution, the habitats recorded as Mvar and SSM, which did not conform to communities recorded in the NVC, be treated as variants of M15 wet heath and therefore as the corresponding Annex I habitat.

5.3.5 7130 Blanket bog

The blanketing of the ground with a variable depth of peat gives the Annex I habitat type its name and results in the various morphological Annex I habitat types according to their topographical position. Blanket bogs show a complex pattern of variation related to climatic factors, particularly illustrated by the variety of patterning of the bog surface in different parts of the UK. Such climatic factors also influence the floristic composition of bog vegetation.

'Active' bogs are defined as supporting a significant area of vegetation that is normally peat-forming. Typical species include the important peat-forming species, such as *Sphagnum* spp. and *Eriophorum* spp., or *Molinia caerulea* in certain circumstances, together with *Calluna vulgaris* and other ericaceous species. In general, throughout Scotland the most abundant NVC blanket bog types are M17, M18, M19, M20 and M25.

Annex I habitat type 7130 Blanket bog therefore correlates directly with a number of NVC communities within the study area such as the M17 and M19 mires. 7130 Blanket bog can also include bog pool communities (M1-M3) where these occur within blanket mires. However, the patches of M1/M2 within the study area were part of patches of wet heath and not considered part of the blanket bog Annex I type. The majority of this Annex I type within the study area is outwith the site boundary (Figure 7.2).

M25 mire can also fall within the 7130 blanket bog Annex I type where the underlying peat depth is greater than 0.5 m or where the habitat is wet and contains peat forming species. Only a small area of the grassier M25b *Anthoxanthum odoratum* sub-community was recorded in the study area (Table 5-1) and is not considered potential Annex I habitat.

5.3.6 4030 European dry heaths

European dry heaths typically occur on freely draining, acidic to circumneutral soils with generally low nutrient content. Ericaceous dwarf shrubs dominate the vegetation. The most common dwarf shrub is *Calluna vulgaris*.

Dry heath in the NVC study area is limited but includes patches of semi-natural H9 and H10 (see Table 5-1) which falls within this Annex I type. These NVC types can also be included within the Annex I habitat type 4060 Alpine

[5] http://jncc.defra.gov.uk/page-1523

and Boreal heaths, but only where they are at higher altitudes and include arctic-alpine floristic elements. These NVC communities within the NVC study area are lower altitudinal examples so they all fall under the 4030 European dry heaths Annex I type.

5.4 Scottish Biodiversity List Priority Habitats

The SBL is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. The SBL was published in 2005 to satisfy the requirement under Section 2(4) of The Nature Conservation (Scotland) Act 2004.

The SBL identifies habitats which are the highest priority for biodiversity conservation in Scotland: these are termed 'priority habitats'. Some of these priority habitats are quite broad and can correlate to a large number of NVC types.

The relevant SBL priority habitat types (full descriptions of which can be found on the NatureScot website[6]), and associated NVC/non-NVC types recorded within the NVC study area are as follows:

- Blanket bog: M17, M19;
- Upland flushes, fens and swamps: M4, M6, M10, S9, S10, S27, Mt, Cn, Svar;
- Upland heathland: M15, Mvar, SSM, H9, and H10; and
- Upland calcareous grassland: CG10.

These SBL priority habitats correspond with UK Biodiversity Action Plan (BAP) Priority Habitats[7].

5.5 Summary

Table 6-3 provides a summary of all the NVC and non-NVC communities recorded within the NVC study area, and any associated habitat sensitivities as described in the sections above.

Table 6-3 Summary of study area NVC communities and sensitivities

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Type Code	SBL Priority Habitat Type
Mires & Flushes			
M1	-	-	-
M2	-	-	-
M4	-	7140 Transition mires and quaking bogs	Upland flushes, fens and swamps
M6	High	-	Upland flushes, fens and swamps
M10	High	7230 Alkaline fens	Upland flushes, fens and swamps
M17, M17b	-	7130 Blanket bogs	Blanket bog
M19	-	7130 Blanket bogs	Blanket bog
M23, M23b	High	-	-
M25b	Moderate	-	-
Wet Heath			
M15, M15a, M15b, M15c, M15d	Moderate	4010 Northern Atlantic wet heaths with *Erica tetralix*	Upland heathland
Dry Heaths			
H9	-	4030 European dry heaths	Upland heathland
H10	-	4030 European dry heaths	Upland heathland
Calcifugous Grasslands			
U4, U4d	-	-	-
U5, U5c	-	-	-
Mesotrophic Grasslands			
MG1	-	-	-
MG5	-	-	-
MG6	-	-	-
MG10, MG10a	Moderate	-	-
Calcicolous Grasslands			
CG10	High	-	Upland calcareous grassland
Woodland & Scrub			
W23	-	-	-
Swamps & Tall-Herb Fens			
S9	-	-	Upland flushes, fens and swamps
S10	-	-	Upland flushes, fens and swamps
S27	Moderate	-	Upland flushes, fens and swamps
Open Habitat Communities			
OV25	-	-	-
OV27	-	-	-
Non-NVC Types			
SSM	Moderate	4010 Northern Atlantic wet heaths with *Erica tetralix*	Upland heathland
Mvar	Moderate	4010 Northern Atlantic wet heaths with *Erica tetralix*	Upland heathland
Svar	-	-	Upland flushes, fens and swamps
Cn	-	-	Upland flushes, fens and swamps
Je	Moderate	-	-
Mt		-	Upland flushes, fens and swamps
AR	-	-	-
PG	-	-	-
BD	-	-	-

[6] https://www.nature.scot/scotlands-biodiversity/habitat-definitions

[7] http://jncc.defra.gov.uk/page-5718

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Type Code	SBL Priority Habitat Type
BG	-	-	-

6 SUMMARY

MacArthur Green was commissioned by the Applicant to review existing habitat data collected in 2014, and to undertake supplementary NVC and habitats surveys for the Proposed Development.

The initial habitat surveys carried out by Caledonian Conservation Ltd were conducted in July and August 2014, details of which are provided in Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. The verification walkover survey and additional NVC and habitat surveys undertaken by MacArthur Green were carried out in August 2018 and March 2019.

The walkover verification survey of the 2014 data resulted in some minor updates to the vegetation classification and descriptions of the vegetation and habitats present as described within Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. The survey found the habitats at the site had not notably changed in type, extent or quality since the original 2014 survey, and that those survey results were still valid. The additional surveys carried out in 2018 and 2019 recorded a similar set of communities and habitats as previously found, and of the same general quality. The character and species compositions of the key or main communities at the site are described within Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm and have not been repeated here due to no evident notable change in the habitats since the earlier survey.

In total 25 NVC communities and 11 non-NVC types were recorded within the NVC study area across the suite of NVC and habitat surveys for the Proposed Development. The most common and extensive habitat type within the study area is M15 wet heath (Table 5-1). The wet heath in the study area is interspersed and mosaiced with several other similar upland mire and heathland NVC and non-NVC types as described above. The wet heath is also degraded from a long history of over-grazing, drainage and burning. The periphery of the site is characterised by improved grasslands and arable fields.

Although some large, relatively homogeneous stands of vegetation occur, most of the communities often form mosaics and transitional areas across the NVC study area.

The survey results have also been compared to a number of sensitivity classifications, indicating the presence of Annex I, SBL and potential GWDTE habitats, as summarised above.

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ANNEX A. NVC TARGET NOTES

Target notes were made during surveys, often to pinpoint an area, feature or species of interest, or to provide further detail on the species assemblage or habitat quality of an area; these are shown on Figure 7.2 and detailed within Table A.1 below.

Table A.1 NVC Study Area Target Notes

TN ID	Source[8]	Date	Easting	Northing	Description
TN1	CC	Jul/Aug 2014	306204	968651	Recently burnt M15 wet heath.
TN2	CC	Jul/Aug 2014	306364	968852	Relatively large stream with small sedge mire (SSM) and M10 mire.
TN3	CC	Jul/Aug 2014	306402	968040	Extensive network of drainage ditches with M10 and small sedge mires.
TN4	CC	Jul/Aug 2014	306844	968999	*Carex nigra* dominated mire.
TN5	CC	Jul/Aug 2014	306912	968897	*Carex nigra* dominated mire.
TN6	CC	Jul/Aug 2014	305383	969028	W23 scrub along large stream.
TN7	CC	Jul/Aug 2014	304860	968953	Border of W23 scrub.
TN8	CC	Jul/Aug 2014	306497	968547	Very wet area *Eriophorum angustifolium* dominated mire (Mvar).
TN9	CC	Jul/Aug 2014	306789	968606	Relatively large stream with small sedge mire (SSM).
TN10	CC	Jul/Aug 2014	306753	968636	Small pools with affinities to S27a swamp.
TN11	CC	Jul/Aug 2014	306529	967682	M10a base rich flush.
TN12	CC	Jul/Aug 2014	305874	967417	Locally frequent *Tofieldia pusilla* (Scottish asphodel) amongst grazed wet heath vegetation.
TN13	CC	Jul/Aug 2014	306502	967833	Base-rich flush. Bryophyte flush with locally abundant *Scorpidium scorpiodies* and *Schoenus nigricans*, fed by seepage line beyond wall to the north. Other species associated with the flush include *Dichodontium palustre*, *Philonotis fontana*, *Campylium stellatum* and *Pinguicula vulgaris.*
TN14	CC	Jul/Aug 2014	305923	968121	Base-rich flush. *Schoenus nigricans* frequent amongst *Molinia caerulea*. *Pinguicula vulgaris* is occasional.
TN15	CC	Jul/Aug 2014	305954	968012	Base-rich flush. Linear flush dominated with small sedges, *Schoenus nigricans* and *Campylium stellatum.*
TN16	CC	Jul/Aug 2014	306048	968017	Base-rich flush. Locally abundant *Schoenus nigricans* with *Molinia caerulea*, *Erica tetralix*, *Erica cinerea*, *Seligeria selaginoides*, *Ctenidium molluscum*, *Palustriella commutata* and *Dicranum bonjeanii/bergeri.*
TN17	CC	Jul/Aug 2014	306622	967444	Base-rich flush. *Caltha palustris* dominated mire with floristically diverse open but frequent sward of small sedges, *Equisetum* sp., *Lychnis flos-cuculi, Epilobium palustre, Ranunculus flammula* over an abundant carpet of bryophytes including *Aulacomnium palustre, Calliergonella cuspidata* and *Rhizomnium punctatum.*
TN18	CC	Jul/Aug 2014	305736	968185	Base-rich flush. Locally frequent *Schoenus nigricans.*
TN19	CC	Jul/Aug 2014	305658	968230	Base-rich flush. Locally frequent *Schoenus nigricans* with *Palustriella commutata, Campylium stellatum* and small sedges including *Carex panicea* and *Carex pulicaris*.
TN20	CC	Jul/Aug 2014	305851	968464	Base-rich flush. Locally frequent *Schoenus nigricans* in a stony flush with *Scorpidium scorpiodies* and *Pinguicula vulgaris*.
TN21	CC	Jul/Aug 2014	306164	967143	M6 - Locally frequent *Juncus effusus* over carpet of *Sphagnum palustre.*
TN22	CC	Jul/Aug 2014	306029	967177	M6 - *Juncus effusus* is frequent along the length of the ditch and occurs over a localised area of frequent to abundant *Sphagnum palustre*.
TN23	MG	Aug 2018	306496	968213	Area has abundant *Trichophorum germanicum* with *Narthecium ossifragum, Calluna vulgaris, Juncus squarrosus*, abundant *Cladonia* sp., *Potentilla erecta, Dicranum scoparium, Erica tetralix, Eriophorum angustifolium, Nardus stricta, Carex panicea* with very small patches of bare peat beneath the field layer (M15c). Everything is cropped due to grazing.
TN24	MG	Aug 2018	306559	967968	Area dominated by *Trichophorum germanicum* with sedges such as *Carex echinata, Carex flacca* as well as *Juncus effusus*, *Erica tetralix, Epilobium palustre*, *Eriophorum angustifolium*, *Pleurozium schreberi* (M15a).
TN25	MG	Aug 2018	306270	967832	Area has a mix of M15a, M15b and M15d.
TN26	MG	Aug 2018	306234	967737	Pond with no aquatic vegetation. Along the edges there are small areas of pure *Potentilla palustris* and areas of *Rynchospora alba*.
TN27	MG	Aug 2018	306201	967724	There are small ponds/pools in this area containing pure stands of *Menyanthes trifoliata* (20% of the polygon) and area has *Molinia caerulea*, *Eriophorum angustifolium*, *Carex echinata*, *Festuca ovina*, *Erica tetralix*, *Calluna vulgaris*, *Cirsium palustre*, *Potentilla erecta*, *Succisa pratensis*, *Epilobium palustre*, *Dicranum scoparium* and *Equisetum palustre*. *Eriophorum vaginatum* and *Trichophorum germanicum* were found in small patches to give some support to M17 but not strongly – some

[8] CC- Caledonian Conservation; MG – MacArthur Green

TN ID	Source[8]	Date	Easting	Northing	Description
					similarities with M15. There are patches of *C. vulgaris* and *E. palustre* which dominate in patches with occasional *Festuca vivipara*, *Viola palustris*, *Carex panicea*, *Ranunculus flammula*, *Pleurozium schreberi*, *Ranunculus repens* and *Caltha palustris.*
TN28	MG	Aug 2018	306207	967677	Area dominated by M15a with *Erica tetralix*, *Trichophorum germanicum*, *Carex panicea*, *Potentilla erecta*, low cropped *Calluna vulgaris*, *Eriophorum angustifolium*, *E. vaginatum*, *Dicranum scoparium*, *Pleurozium schreberi*, *Cladonia* sp., *Narthecium ossifragum*, *Rhytidiadelphus triquetrus*, *Racomitrium lanuginosum*, *Nardus stricta*, *Sphagnum capillifolium*, *Succisa pratensis*. Area grassy with very wet patches and abundant *Sphagnum* moss.
TN29	MG	Aug 2018	305744	967616	M15 wet heath with abundant *Juncus conglomeratus*, *Erica tetralix*, *Calluna vulgaris*, *Eriophorum angustifolium*, *Molinia caerulea*, *Potentilla erecta*, *Galium saxatile*, *Hylocomium splendens*, *Brachythecium rutabulum*, *Trichophorum germanicum*, *Carex echinata* and dense patches of *Sphagnum papillosum* and *S. capillifolium.*
TN30	MG	Aug 2018	305794	967812	S27 swamp area contains abundant *Carex rostrata*, *Menyanthes trifoliata*, *Juncus acutiflorus*, *Ranunculus flammula*, *Calliergonella cuspidata*, *Pedicularis palustris*.
TN31	MG	Aug 2018	305908	967699	Area best fits M15c with abundance of *Cladonia* spp. There are a number of scattered bare peat patches although not significant in total. Area heavily grazed with small field drains
TN32	MG	Aug 2018	306065	967821	Fits M15c with dominant *Trichophorum germanicum* and *Cladonia* sp. Assemblage also contains *Narthecium ossifragum*, *Carex panicea*, occasional *Calluna vulgaris*, *Deschampsia flexuosa*, *Molinia caerulea*, *Succisa pratensis*, *Epilobium palustre*, *Ranunculus flammula*. Some wetter areas contain *Schoenus nigricans*, but wider area is dominated by M15.
TN33	MG	Aug 2018	306117	968054	Most closely resembles M15c. *Trichophorum germanicum*, *Cladonia* sp., *Calluna vulgaris*, *Juncus squarrosus*, *Carex panicea*, *Racomitrium lanuginosum*, *Narthecium ossifragum*.
TN34	MG	Aug 2018	305939	968212	Wet heath (M15) dominates with small patches of acid grassland. Some areas of *Calluna vulgaris* look to be less grazed while other areas are more clipped. Areas less grazed have a much taller, bushier canopy of *C. vulgaris*.
TN35	MG	Aug 2018	306319	968412	*Equisetum fluviatile* is very dominant in S10 swampy area with small patches of *Carex rostrata*.
					Otherwise species poor. Quite dry at time of survey. Some small patches of *Menyanthes trifoliata*.
TN36	MG	Aug 2018	306104	968425	Transitional area between wet heath and improved grassland (U5/M15/U4).
TN37	MG	Aug 2018	306390	968653	M15/U4/U5 wet heath/acid grassland mosaic. Heavily grazed by sheep.
TN38	MG	Aug 2018	306480	968529	Large area of M15 wet heath dominated by *Eriophorum angustifolium*, occasional *E. vaginatum*, *Potentilla erecta*, *Juncus squarrosus*, *Erica tetralix*, *Trichophorum germanicum*, very abundant *Sphagnum capillifolium*, *Molinia caerulea*, *S. papillosum*, occasional *Calluna vulgaris*, some *S. fallax*, *Drosera rotundifolia* and *Agrostis stolonifera.*
TN39	MG	Aug 2018	306698	968501	M15 covers mostly level ground with *Calluna vulgaris* very clipped from heavy sheep grazing. Mostly comprises M15a and M15c.
TN40	MG	Aug 2018	306882	968583	M15/U5 - Grassy field layer of *Anthoxanthum odoratum*, *Molinia caerulea*, *Agrostis* sp., *Nardus stricta*, *Erica tetralix*, *Potentilla erecta*, *Cirsium palustre*, *Pleurozium schreberi*, *Galium saxatile*, *Ranunculus flammula*, *Luzula pilosa*, *Festuca vivipara*, *Juncus conglomeratus*, *Succisa pratensis* with patches of dense *Eriophorum angustifolium* and *Equisetum palustre*.
TN41	MG	Aug 2018	306947	968739	Most of the wider area is M15c with vegetation very cropped due to grazing and weather (more exposed along the coast). Species present included *Narthecium ossifragum*, *Calluna vulgaris*, *Trichophorum germanicum*, *Erica tetralix*, *Carex flacca*, *Juncus squarrosus*, *Cladonia* sp., *Eriophorum angustifolium*, and *Sphagnum capillifolium*.
TN42	MG	Aug 2018	306723	968310	*Calluna vulgaris* condition clipped with intensive grazing within wider wet heath area. Approx. 10cm in height on average.
TN43	MG	Aug 2018	306382	968119	Recorded as M10 for drainage ditches. *Schoenus nigricans* dominates with *Erica tetralix*, *Carex panicea* and *Prunella vulgaris*.
TN44	MG	Aug 2018	306383	967917	*Calluna vulgaris* much bushier and taller suggesting lighter grazing levels. Any grassy areas have a much taller sward height. Average height approximately 25 - 30cm.
TN45	MG	Aug 2018	306410	967636	*Calluna vulgaris* heavily grazed with sheep and cattle. Small sedge mire (SSM) patches with dominant *Schoenus nigricans*. Grassy wet heath. Further north more acid grassland appears and moves towards mesotrophic grassland.

TN ID	Source[8]	Date	Easting	Northing	Description
TN46	MG	Aug 2018	305827	967951	Grazing intensity much lower with the *Calluna vulgaris* being more established and taller. The area also includes small dense patches of *Juncus* sp.
TN47	MG	Aug 2018	305841	968340	Wet heath continues downslope to improved grassland areas. *Calluna* is cropped short on dry summits and small flushed patches with dominant *Schoenus nigricans*.
TN48	MG	Aug 2018	305652	968611	Mix of W23, M23a and M15. Moderate levels of grazing between *Ulex europaeus* scrub.
TN49	MG	Aug 2018	305960	968566	Area becomes much more of an improved grassland with a mix of U4, U5, and MG6 extending down to the farm buildings.
TN50	MG	Mar 2019	306509	967068	M15 - Patches of *Eriophorum vaginatum*, *E. angustifolium*, *Deschampsia flexuosa*, occasional *Calluna vulgaris* with the mosses *Sphagnum papillosum*, *Polytrichum commune*, *S. palustre*, *Plagiothecium undulatum*, *S. capillifolium*, *Dicranum scoparium*. Slightly drier patches where *Calluna* more abundant but lots of *Sphagna*, *Cladonia* sp. and *Luzula* sp.
TN51	MG	Mar 2019	306723	966995	Example of the bog pools in the wider area with *Eriophorum angustifolium*, *Sphagnum cuspidatum*, *S. fallax*, *S. capillifolium*, *E. vaginatum* around the edges with patches of *Calluna*.
TN52	MG	Mar 2019	306803	967023	Bog pool.
TN53	MG	Mar 2019	306970	967325	Former quarry area.
TN54	MG	Mar 2019	306823	967807	SSM - *Juncus effusus*, *Carex binervis*, *C. nigra*, *C. echinata*, *C. flacca*, *Succisa pratensis*, *Potentilla erecta*, occasional *Eriophorum angustifolium*, *Juncus conglomeratus*, *Schoenus nigricans*, and mosses *Pseudoscleropodium purum*, *Rhytidiadelphus squarrosus*, *Calliergonella cuspidata*. This area was classified as SSM (sedge mire) in previous survey.

ANNEX B. GENERAL SITE PHOTOGRAPHS

The following selected photographs are provided to give a visual representation to a number of the community types present within the NVC study area.

Photo B1 'Mvar' *Eriophorum angustifolium* dominated mire

Photo B2 Typical M15 wet heath of the study area with abundant *Trichophorum germanicum* and short clipped *Calluna vulgaris*

Photo B3 Wet heath/acid grassland mosaic

Photo B4 Heavily degraded wet heath in the study area

Photo B5 S10 *Equisetum fluviatile* swamp

Photo B6 Acid grassland and *Ulex europaeus* scrub

ANNEX C. GWDTE ASSESSMENTS

NVC communities recorded within the NVC study area have been mapped as potential GWDTE based on Appendix 4 of SEPA's Land Use Planning System (LUPS) Guidance Note 31 (SEPA, 2017a).

The sensitivity of each polygon containing a potential GWDTE is classified on a four-tier approach as follows:

- 'Highly – dominant' where potential high GWDTE(s) dominate the polygon;
- 'Highly - sub-dominant' where potential high GWDTE(s) make up a sub-dominant percentage cover of the polygon;
- 'Moderately – dominant' where potential moderate GWDTE(s) dominate the polygon and no potential high GWDTEs are present; and
- 'Moderately - sub-dominant' where potential moderate GWDTE(s) make up a sub-dominant percentage cover of the polygon and no potential high GWDTEs are present.

Where a potential high GWDTE exists in a polygon, it outranks any potential moderate GWDTE communities within that same polygon.

Baseline Conditions

Topography and Climate

The Proposed Development is located on an area of low-lying topography, 2 km south of Scotland's north coast (Thurso coastline) and 4.5 km south-east of the settlement of Thurso. The Proposed Development Area elevation rises from the north (at an elevation of 65mAOD) to a higher ridge through the centre of the Proposed Development Area, with a maximum elevation of 140 m AOD at the eastern extent.

The closest MetOffice station is Strathy East, located approximately 20 km to the west of the Proposed Development. This station records an annual average rainfall (1991-2020) of 984.55 mm which is below the annual average for the Scotland North region (1702.52 mm). The annual average sunshine (1991-2020) is 1262.31 hours, higher than the annual average for Scotland North (1103.92 hours).

Hydrological Setting

The northern extent of the Proposed Development drains to the north via a network of small artificial and straightened drains and small watercourses towards to the Burn of Brims and Thusater Burn which drain to the coast. The southern extent of the Proposed Development drains through drains to the Burnside Burn which drains to Thurso Bay.

Hydrogeological Setting

The bedrock aquifer unit underlying the site of the Proposed Development is the Scrabster Flagstone Member (siltstone and sandstone). This is a moderately productive aquifer unit which locally yields small amounts of water. The bedrock sits within the Upper Caithness Flagstone Subgroup (Parent unit being Old Red Sandstone, North) and is characterised within the British Geological Survey (BGS) as laminated carbonate rich siltstones and shales, with subordinate fine-grained, thinly bedded sandstones. This unit is termed as 'flaggy' consisting of interbedded siltstone, mudstone and conglomerates which are well cemented. Well cemented units have lower permeability and have a poorer hydraulic conductivity (are less able to hold and transmit groundwater). Groundwater flow and storage within the bedrock aquifer unit is largely restricted to fracture flow. Well-cemented layers will limit vertical flow of water, and groundwater units will be highly localised and confined.

The bedrock unit is found at outcrop in areas across the site. There are minimal overlying superficial deposits. Small areas of peat deposits are identified on the British Geological Survey (BGS) 1:50,000 scale superficial deposit map in the east of the site, and on the flatter topography to the north and south of Cairnmore Hillock. Superficial diamicton deposits (a clay-rich conglomerate similar to a glacial till) is located in the eastern extent of the site.

The results of site-specific peat probing are reported in the EIA Report Volume 4: Technical Appendix 2.45: Phase 1 & 2 Peat Depth and Coring Survey Report; Section 6.3.6 of that Technical Appendix reports the mean pH of five peat core subsamples collected. As expected for a peat core, most of the samples were acidic in nature, however one sample had an alkaline pH of 8.3. Alkaline peat samples can occur in instances where base-rich groundwater interacts with, and influences peat character, for example in the formation of 'fen' peat that can be found in fen or swamp habitats (as opposed to acidic ombrogenous peat formed directly from precipitation). Additionally, the pH of peat samples can also be raised in the presence of an underlying alkaline geology. The alkaline core is from an area of the site where moderately sub-dominant GWDTE is mapped, indicating that the influence may be the underlying geology, or a mix with groundwater. Further evidence of alkalinity around the site is highlighted by areas of calcareous grassland and base-rich flushes within the NVC study area.

GWDTE across the site and NVC study area are shown in Figure 7.3. It is evident that most of the site is covered by polygons of moderate dependency habitat (dominant or sub-dominant).

The results of the GWDTE analysis appear to support the characterisation of the underlying hydrogeology. The limited number of polygons containing highly dependent groundwater habitats appears to reflect that groundwater is more confined within the bedding planes. The potential for flow paths to occur in permeable faults (and weathered areas) and emerge as localised base-rich flushes, would also explain the higher number of springs evident across the site.

Assessment of GWDTEs

Identified potential GWDTE

In accordance with the SEPA Guidance, GWDTE have been assessed where they are within 100 m of excavations less than 1 m in depth, and 250 m of excavations greater than 1 m in depth. It has been assumed that tracks and temporary hardstanding will require excavations less than 1 m, whilst excavations for the remaining infrastructure are assumed to be at a depth of 1 m or greater, as a conservative approach.

The potential GWDTE features identified from the NVC Phase 1 survey are shown in Figure 7.4. The assessed true groundwater dependency based on the site-specific hydrology and hydrogeology is outlined in Table 2-1, and further justified in the text below.

Table 2-1 Identified potential GWDTE

NVC Habitat	Potential GWDTE Status	Site-specific groundwater dependency
M15	Moderately groundwater dependent	Ombrotrophic (surface and rainwater dependent). Potential for small amount of groundwater contribution.
M23	Highly groundwater dependent	Ombrotrophic (surface and rainwater dependent). Potential for small amount of groundwater contribution.
MG10a	Moderately groundwater dependent	Majority ombrotrophic. Potential to be partially dependent on groundwater.

NVC Habitat	Potential GWDTE Status	Site-specific groundwater dependency
S27	Moderately groundwater dependent	Majority ombrotrophic. Likely to be partially dependent on groundwater.
Springs	Highly groundwater dependent	Highly groundwater dependent

M15 Habitat

M15a, b, c and d NVC habitat is present across the site. It is classed as wet heath, a potentially moderately groundwater dependent habitat. The M15 habitat in the study area is interspersed and mosaiced with several other similar upland mire and heathland NVC and non-NVC types typical of ombrotrophic, acidic peatland soils. The wet heath is degraded from a long history or over-grazing, drainage and burning.

M15a and M15b are the majority habitat type across the site. Due to the low yielding, highly localised and confined nature of the aquifer unit, it is not considered that groundwater is available extensively across the site. As such, the M15 habitat is considered to be ombrotrophic (surface and rainwater fed) with potential for small groundwater contribution. Direct rainfall and shallow sub-surface drainage through peatland and mineral soils is likely to be the primary source of water to the M15 habitats.

M23 Habitat

M23 NVC habitat is marsh/marshy grassland/ mire and is classed as a potentially highly groundwater dependent habitat. M23 habitat is located in an isolated pocket in the west of the study area and area to the east (beyond the site boundary). The area of M23 habitat in the west of the study area corresponds with the drainage pathway of a small ephemeral burn and artificial drainage channels and has been heavily drained. The area of M23 habitat to the west is underlain by impermeable superficial deposits resulting in limited potential connectivity to groundwater at this location.

Due to the low yielding properties of the aquifer unit at the surface, the presence of superficial deposits and of surface water features in the location of the M23 habitat, it is considered that the habitat is ombrotrophic (surface water fed) with potential for small groundwater contribution. Shallow sub-surface drainage through peatland soils and overland flow is likely to be the source of water to the M23 habitats.

MG10a Habitat

MG10a habitat is semi-improved natural grassland and is classed as a potentially moderately groundwater dependent habitat. MG10a is located in the east of the site in an area of arable crop fields which is routinely ploughed. This habitat is highly altered/ degraded by the presence of the arable fields. This habitat is likely to be majority rainwater fed and shallow sub-surface waters but has potential to be partially groundwater dependent.

S27 Habitat

S27 habitat is swamps and tall-herb fens. This is associated with a waterbody located on the site at the Hill of Forss in the east, and at the base of Carinmore Hillock in the west. Due to the low yielding nature of the groundwater aquifer unit, and the relatively high rainfall levels, it is likely that this habitat is largely ombrotrophic. However, as the waterbody is understood to be a permanent feature, it is likely partially dependent on groundwater.

Springs

A number of springs were identified as target notes in the Phase 1 NVC survey, forming small areas of groundwater dependent habitat and draining to surrounding GWDTE habitat. These have been assessed as being highly groundwater dependent.

GWDTE that have the greatest potential to be influenced by groundwater flows are the highly dependent habitats as shown in Figure 7.4. The impact of the Proposed Development on localised groundwater flow paths to these highly dependent habitats has been assessed below.

Impact of the Proposed Development

The site layout was designed based on the principles of avoidance first, minimisation and mitigation across all site constraints. Due to the widespread and frequent nature of the springs and flush habitats, avoidance of the 250 m buffer of these features was not feasible in all instances amongst other site constraints. The habitats have been assessed and mitigation proposed where required to minimise the potential effect on the groundwater flow path as shown in Table 2-2 .

Table 2-2: GWDTE Impact Assessment

NVC Habitat	Potential GWDTE Status	Infrastructure >1m deep excavations within 250m	Infrastructure <1m deep excavations within 100m	Potential Impact
M23	High	T1	T1 crane hardstanding and access tracks	Infrastructure located upgradient of habitat. Potential to effect localised surface water and shallow sub-surface flow paths to this habitat. Potential for groundwater pollution from concrete use in turbine foundations, sediment from excavations and other chemical pollutants used in construction.
MG10a	Moderate	T5	T5 crane hardstanding and access tracks	Infrastructure located upgradient of habitat. Potential to effect localised flow paths to this habitat. Habitat highly altered by farming activities. Potential for groundwater pollution from concrete use in turbine foundations, sediment from excavations and other chemical pollutants used in construction.
M15c	Moderate	T5	T5 crane hardstanding and access tracks	Hydraulically disconnected from infrastructure due to presence of drains. **No Impact.**
M15b	Moderate	T1, T2, T3, T5	T1, T2, T3, T5 crane hardstandings and access tracks. Construction compounds.	Infrastructure located upgradient of habitat. Potential to effect localised shallow flow paths to this habitat. Potential for groundwater pollution from concrete use in turbine foundations, sediment from excavations and other chemical pollutants used in construction.
M15a	Moderate	T1, T2, T3, T4, T5	T1, T2, T3, T4, T5 crane hardstandings, access tracks, construction compounds	Infrastructure located upgradient of habitat. Potential to effect localised shallow flow paths to this habitat. Potential for groundwater pollution from concrete use in turbine foundations, sediment from excavations and other chemical pollutants used in construction.

NVC Habitat	Potential GWDTE Status	Infrastructure >1m deep excavations within 250m	Infrastructure <1m deep excavations within 100m	Potential Impact
M15d	Moderate	T4	Access tracks	Potential to effect localised shallow flow paths to this habitat. Potential for groundwater pollution from concrete use in turbine foundations, sediment from excavations and other chemical pollutants used in construction.
S27	Moderate	T3	Access tracks	Infrastructure not located upstream of habitat or hydraulically disconnected from habitat due to presence of drains. Infrastructure unlikely to directly impact groundwater flows to this habitat. **No Impact.**
Springs	High	T1, T2, T4, T5	T1, T2, T4, T5 crane hardstandings, access tracks, construction compounds	Potential to effect localised shallow flow paths to this habitat. Potential for groundwater pollution from concrete use in turbine foundations, sediment from excavations and other chemical pollutants used in construction. The layout has avoided infrastructure being placed on the location of springs.

It is noted that dewatering may be required at the turbine bases. Due to flow being confined within localised permeable fractures, smaller volumes of water may be disrupted during the excavation, however significant volumes of water within the excavation areas are not anticipated. This should be confirmed following initial ground investigations at the site.

Dewatering should be employed at turbine bases where groundwater is present to isolate groundwater from concrete and sediment pollution associated with construction foundations. Groundwater pumped out during the dewatering process should be returned to the same groundwater catchment.

Mitigation measures to minimise the impacts on habitats are outlined below.

Mitigation

To reduce the potential impacts on GWDTE habitats from the Proposed Development, the flow regime of shallow flow pathways within the peatland and mineral soils and overland flow should be maintained. This will be done by designing and implementing cut-off drains around turbines and associated hardstanding.

Linear infrastructure such as access tracks can act as a barrier to flow pathways. Cross drains will be built into the track design to allow movement of water across the track from upgradient areas. Care should be taken to prevent all upgradient drainage from being channelled into trackside drains which will move water away from the downgradient habitat. Access track infrastructure is considered to be of shallow excavations, which will have minimal effect on true groundwater aquifer units.

Specific mitigation in relation to dewatering may be required once dewatering volumes and locations are known. Dewatering can minimise the impact on groundwater by preventing non-cured concrete from interacting with groundwater.

The mitigation proposed in this assessment to maintain localised areas of hydrological connectivity, will be built into the detailed design and stated in Technical Appendix 2.1: Outline Construction Environmental Management Plan (CEMP).

Pollution prevention measures outlined in the CEMP and Pollution Prevention Plans (PPP) are considered to be sufficient to minimise the potential for chemical and silt pollution to GWDTE habitats. This will prevent and minimise the release of contaminated water and sediments to the water environment (including groundwater units).

Cairnmore Hill Wind Farm

Protected Species Survey Report

Technical Appendix 7.2

Date: 29 April 2022

Tel: 0141 342 5404

Web: www.macarthurgreen.com

Address: 93 South Woodside Road |Glasgow | G20 6NT

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EXECUTIVE SUMMARY

MacArthur Green was commissioned by RES Ltd ('the Applicant') to carry out protected species surveys for the proposed Cairnmore Hill Wind Farm (referred to as the 'Proposed Development').

These protected species surveys were undertaken to aid and inform the ecological assessment for the Proposed Development's Environmental Impact Assessment (EIA).

The protected species and fish habitat surveys were conducted on 28th and 29th August 2018 by MacArthur Green. An additional protected species survey was conducted on 6th March 2019 to cover off additional survey areas resulting from changes to the Proposed Development layout. There was no evidence of otter, water vole or pine marten recorded during the surveys. A number of mammal holes were recorded during the surveys in 2018 and 2019, and although some of these were considered to be a suitable size and structure for badger, no other diagnostic field signs of badger were recorded within the study area. In 2019, a potential badger print was recorded in the east of the protected species study area but no setts were confirmed. A number of features with the potential to act as reptile hibernacula were recorded during the surveys.

Due to a redesign of the Proposed Development in April 2022, a number of previously constraining ecological features within the protected species study area, including potential reptile hibernacula and mammal holes, are now out-with the revised site boundary. The protected species study area and site boundary are shown in Figure 7.5.

Surveys for bats were carried out separately and are reported on in Technical Appendix 7.3: Bat Survey Report

1 INTRODUCTION

MacArthur Green was commissioned by RES Ltd ('the Applicant') to carry out protected species surveys at the site of the proposed Cairnmore Hill Wind Farm (hereafter referred to as the 'Proposed Development'). These surveys focussed on otter (Lutra lutra), water vole (Arvicola amphibius), badger (Meles meles), and pine marten (Martes martes). A watching brief was also maintained and signs recorded for other protected species potentially inhabiting the site, i.e. native reptiles: the adder (Vipera berus); common or viviparous lizard (Zootoca vivipara); and slow worm (Anguis fragilis). Fish habitat surveys were also carried out to assess the suitability of watercourses within the site for supporting fish species, namely Atlantic salmon (Salmo salar), brown trout (Salmo trutta), European eel (Anguilla anguilla) and lamprey (all native species).

Surveys for bats were carried out and are reported separately (refer to Technical Appendix 7.3: Bat Survey Report).

These protected species surveys were undertaken to aid and inform the ecological assessment for the Proposed Development's Environmental Impact Assessment (EIA).

Initial baseline surveys were conducted for the site by Caledonian Conservation in 2014. The results of these surveys are referenced within this report; however, detailed results are contained within Technical Appendix 7.4 : Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. Surveys to update the baseline were conducted in 2018 and 2019 by MacArthur Green.

2 THE SITE

The Proposed Development site ('the site') covers an area of approximately 3.58 km2 located approximately 4.5 km west of Scrabster on the north coast of Caithness, in the Scottish Highlands. The site is low lying, with the highest point at 138 m above sea level at Hill of Forss within the centre of the site; Cairnmore Hillock reaches 134 m to the west of the site. The southern central area of the site is a level plateau area of relatively shallow peatland extending over Lythmore Moss, which is characterised by heavily grazed and degraded wet heath and wet modified bog. The edges of the site are underlain by mineral soils, and are dominated by semi-improved grasslands, improved pasture and fields ploughed and used for crops. There is no woodland present within the site.

There are a number of small watercourses present within the site, many of which feed into the Burn of Brims.

3 LEGAL PROTECTION

The details of the legal protection of the protected species surveyed for are given in Annex 1.

4 METHODS

Surveys to record the presence or absence of otter, water vole, badger and pine marten were carried out at the site on the 28th and 29th August 2018. During the survey, all habitats suitable for these species were surveyed around the proposed infrastructure locations, as proposed at the time, plus an appropriate buffer according to the species involved. The survey buffers accounted for a 50 m micrositing tolerance. The survey buffers associated with each species are outlined in the sections below.

Additional surveys for protected species were undertaken on 6th March 2019 to cover off areas which were not previously surveyed, due to changes in the proposed infrastructure locations. The areas that were covered by the 2018 and 2019 protected species surveys are hereafter referred to as the protected species 'study area', illustrated in Figure 7.5.

The field signs found indicate the type and level of activity, and consequently help in the assessment of the importance of a particular area for the protected species. The survey methods used are described below.

4.1 Otter

All accessible watercourses within the study area (proposed infrastructure layout at the time of survey plus a 300 m buffer) were surveyed for otter field signs. Otter field signs and survey methods are described in Bang & Dahlstrøm (2001), Sargent & Morris (2003) and Chanin (2003), and include:

Holts: Underground features where otters live. They can be tunnels within bank sides, underneath root-plates or boulder piles, and even man-made structures such as disused drains. Holts are used by otters to rest up during the day, and are the usual location of natal or breeding sites. Otters may use holts permanently or temporarily;

Couches: These are above ground resting-up sites. They may be partially sheltered, or fully exposed. Couches may be regularly used, especially in reed beds and on in-stream islands. They have been known to be used as natal and breeding sites. Couches can be very difficult to identify, and may consist of an area of flattened grass or earth. Where rocks or rock armour are used as couches, these can be almost impossible to identify without observing the otter in-situ;

Prints: Otters have characteristic footprints that can be found in soft ground and muddy areas;

Spraints: Otter faeces may be used to mark territories, often on in-stream boulders. They can be present within or outside the entrances of holts and couches. Spraints have a characteristic smell and often contain fish remains;

Feeding signs: The remains of prey items may be found at preferred feeding stations. Remains of fish, crabs or skinned amphibians can indicate the presence of otter;

Paths: These are terrestrial routes that otters take when moving between resting-up sites and watercourses, or at high flow conditions when they will travel along bank sides in preference to swimming; and

Slides and play areas: Slides are typically worn areas on steep slopes where otters slide on their bellies, often found between holts or couches and watercourses. Play areas are used by juvenile otters in play, and are often evident by trampled vegetation and the presence of slides. These are often positioned in sheltered areas adjacent to the natal holt.

Any of the above signs (apart from paths) are diagnostic of the presence of otter. However, it is often not possible to identify couches with confidence unless other field signs are also present. Spraints are the most reliably identifiable evidence of the presence of this species.

4.2 Water Vole

All watercourses within the study area (proposed infrastructure layout at the time of survey plus a 150 m buffer) were surveyed for water vole field signs following the methodology prescribed in Dean et al., 2016. This involved searching for the following field signs:

Faeces: Recognisable by their size, shape, and content. If not too dried-out these are also distinguishable from rat droppings by their smell;

Latrines: Faeces, often deposited at discrete locations;

Feeding stations: Food items are often brought to feeding stations along pathways and hauled onto platforms. Recognisable as neat piles of chewed vegetation up to 10 cm long;

Burrows: Appear as a series of holes along the water's edge distinguishable from rat burrows by size and position;

Lawns: May appear as grazed areas around land holes;

Nests: Where the water table is high above ground woven nests may be found;

Footprints: Tracks may occur at the water's edge and lead into bank side vegetation. May be distinguishable from rat footprints by size; and

Runways in vegetation: Low tunnels pushed through vegetation near the water's edge; these are less obvious than rat runs.

4.3 Badger

Land with the potential to support badger within the study area (proposed infrastructure layout at the time of survey plus 150 m survey buffer) was searched for field signs. Field signs of badger are described in Neal and Cheeseman (1996), Bang and Dahlstrøm (2001), and Scottish Natural Heritage (2001). Field evidence searched for included:

Setts: Single or groups of holes/structures which show evidence of current use by badger;

Prints: Badgers have characteristic footprints that can be found in soft ground and muddy areas;

Latrines and dung pits: These are small excavated pits in which droppings are deposited. Often used as territorial markers;

Hairs: Tufts of hair can often be found on fences, or in the entrances to setts;

Feeding signs (snuffle holes): Small scrapes where badgers have searched for insects and plant tubers;

Scratching posts: Marks on trees (including fallen trees) where badgers have scratched leaving claw marks or ripped at areas of rotten bark to search for food; and

Paths: These are routes that badgers take when moving between setts and foraging areas.

4.4 Pine Marten

Signs of pine marten were searched for within the study area (proposed infrastructure layout at the time of survey plus 150 m buffer) following guidance from O'Mahony et al. (2006). Survey methods included:

Scats: Searches for pine marten scats were made along linear features such as fence lines, and around rock piles and dense scrub where the species could establish a den.

Dens: Identification of features which could be used as a den. Dens can include the utilisation of upturned trees, tree cavities, rocks or manmade structures such as log piles or large bird boxes.

4.5 Other Protected Species

It was not considered necessary to undertake targeted reptile surveys; however, incidental records of reptile sightings, or signs such as shed skins, and features of particular importance (i.e. potential hibernacula) were recorded.

A number of ponds were identified pre-survey on Ordnance Survey mapping. However, it was not deemed necessary to conduct surveys for great crested newts (Triturus cristatus) given that the site is located outwith their known species range (Oldham et al., 2000).

Fish habitat surveys were also carried out on the 28th and 29th of August 2018. All known watercourses were walked and assessed for their suitability for supporting fish. Where habitat available for utilisation by fish was identified, these were described following Scottish Fisheries Coordination Centre (SFCC) (2007) and Hendry & Cragg-Hine (1997) habitat definitions.

Other protected mammals species present in Scotland include Scottish wildcat (Felis silvestris), red squirrel (Sciurus vulgaris), and beaver (Castor fiber), however due to a lack of suitable habitat on site, it was not considered necessary to undertake targeted surveys.

5 SURVEY DETAILS AND LIMITATIONS

The surveys conducted in August 2018 were undertaken in dry weather conditions and watercourses were considered to be at average flow levels (i.e. were not considered to be at low levels or in spate). The additional survey in March 2019 was also carried out in dry weather conditions.

All parts of the protected species study area were accessible during surveys and no access or weather limitations were experienced during surveys.

The results of surveys are over two years old, however, as two separate protected species surveys over the site were completed in 2018 and 2019 it is considered this provides a robust baseline to undertake the ecological assessment on. In line with normal practice, further surveys will be completed during the pre-construction and construction phase to ensure compliance with wildlife legislation.

6 RESULTS

There was no evidence of otter, water vole or pine marten recorded during the surveys. Mammal holes with the potential for use by badger were recorded, although presence of badger could not be confirmed. Several features with the potential to act as reptile hibernacula were recorded, however, many of these features are distant from infrastructure and not a constraint (see Figure 7.5).

No suitable fish habitat was recorded in the study area, with most channels either being completely dry and highly modified.

All results are listed within Annex 2, with associated photos in Annex 3. All survey results are illustrated on Figure 7.5: Protected Species Survey Results.

7 DISCUSSION

7.1 Designated Sites

There are no designated sites located within the site. There are seven designated sites present within 5 km of the Proposed Development which have ecological designations. The River Thurso SAC, designated for Atlantic salmon is 3.48 km from the site, and is the only site designated for an ecological feature related to a protected species outlined in this report. Further information on the designations can be seen in Chapter 7: Ecology and illustrated on Figure 7.1.

7.2 Otter

There were no field signs of otter recorded during the surveys in 2018 or 2019. This is consistent with the findings of the baseline surveys undertaken in 2014 (Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm).

There are a number of small watercourses present within the study area, all of which were considered to have low suitability for otter. The study area offers limited foraging opportunities for otter with the site recording no suitability for fish and low suitability for amphibian species. It is possible that otters are utilising the coastal habitats to the north of the site and could use the watercourses as commuting features between other habitats, but given the suitability of the watercourses in the wider area, the potential for this is considered to be low.

7.3 Water Vole

There was no evidence of water vole recorded during the 2018 or 2019 surveys. This is consistent with the findings of the baseline surveys undertaken in 2014 (Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm).

The watercourses within the study area are considered to have very low suitability for supporting water voles. The watercourses have relatively low banks which are often rocky, and good terrestrial vegetation for water voles is limited along the banksides.

7.4 Badger

There was no confirmed evidence of badger recorded during the surveys. Baseline surveys conducted in 2014 found no evidence of badger using the site (Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm).

Three mammal holes were recorded within close vicinity of each other in 2018 to the south of infrastructure between turbines 3 and 4. There were no diagnostic field signs of badger recorded within the vicinity of the structures; however, they were considered to be of a size and structure suitable for badger. Another mammal hole was recorded in 2019 out-with the site boundary, which again showed suitability for badger but had no diagnostic field signs. In 2019, a potential badger print was recorded to the east of the study area.

There was limited habitat present within the study area that has suitability for supporting badgers. There is limited suitable substrate for supporting sett-building due to its shallow, rocky nature or it being peaty and waterlogged. However, there are some more suitable habitats that offer free draining soil and foraging opportunities within the outer fringes of the study area, if badger are present within the wider area.

7.5 Pine Marten

There was no evidence of pine marten recorded during the surveys in 2018 or 2019. This is consistent to the findings of the baseline surveys undertaken in 2014 (Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm).

There is limited habitat that is suitable for pine marten within the study area, given the lack of woodland cover. As a result, there are very limited denning opportunities offered by the study area.

7.6 Other Protected Species

There were a number of structures recorded within the study area in 2018 and 2019 that have the potential to act as reptile hibernacula. For instance, stone walls and the disused quarry areas with piles of quarry slabs, which were located in the south-east of the study area near Hopefield House, out-with the site. Only three potential hibernacula remain within the site boundary, and the closest of these to any turbine or infrastructure occurs approximately 34 m south of the track between turbines 3 and 4 (Figure 7.5). The potential hibernacula features were located adjacent to habitats that are heavily grazed by sheep with poor vegetation cover which has a high disturbance level, and therefore the likelihood of these hibernacula features being used in this area is considered to be low, however it is recommended that a suitably experienced ecologist conducts a pre-construction walkover to detect the presence of any protected reptiles that may be basking in the vegetation surrounding the potential hibernacula.

Small mammal holes, in addition to those described above in Section 7.4, were recorded in three locations across the study area in 2018. All of these features were deemed too small to accommodate badger and were likely used by other species such as stoat, weasel or previously rabbits (refer to Annex 2). As these features are considered unlikely to be used by a protected species and non-constraining, they have been excluded from Figure 7.5.

None of the watercourses within the study area were deemed suitable for supporting any populations of fish. The watercourses in the study area have typically been highly modified for the purposes of drainage, and many of them were dry with no water. Most watercourses on the site are subject to high degrees of poaching by livestock, and there is very little suitable instream or bankside cover available for supporting fish. Additionally, where channels do contain water, the depths observed were typically less than 5 cm and often flowing over sheets of bedrock providing overall very poor fish habitat. The most notable watercourse, Burn of Brims, which drains the majority of the site to the north was noted passing underneath a twin-piped culvert (grid reference 305757, 968862) creating an obstacle to any potential fish migration upstream into the site. Furthermore, the same watercourse was also noted as being dry as it passes underneath the A836 road to the north of the site at approximate grid reference 305243, 969129. The channel here had a high covering of moss which was capturing all water flow at the time of survey.

8 SUMMARY

There was no evidence of otter, water vole or pine marten during the surveys in 2018 or 2019. Mammal holes were recorded in 2018 which were considered to be of a size and structure suitable for badger, however there were no further diagnostic features of badger recorded. A potential badger print was recorded in 2019 but not in the immediate vicinity of the mammal holes. Three structures with the potential to be used as reptile hibernacula were recorded within the site boundary, none of which were less than 30 m from planned infrastructure.

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ANNEX A. LEGAL PROTECTION

Otters receive protection under the Conservation Regulations (1994) (as amended) only[1].

Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)

Under Regulation 39 (1) it is an offence to:

(a) deliberately or recklessly to capture, injure or kill a wild animal of a European protected species;

(b) deliberately or recklessly:

(i) to harass a wild animal or group of wild animals of a European protected species;

(ii) to disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;

(iii) to disturb such an animal while it is rearing or otherwise caring for its young;

(iv) to obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;

(v) to disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; or

(vi) to disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young;

(c) deliberately or recklessly to take or destroy the eggs of such an animal; or

(d) to damage or destroy a breeding site or resting place of such an animal.

Regulation 44 (2e) allows a licence to be granted for the activities noted in Regulation 39 such that:

Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.

Otter is also listed on Appendix I of CITES, Appendix II of the Bern Convention and Annexes II and IV of the Habitats Directive (1994). It is also listed as globally threatened on the IUCN/WCMC Red Data List.

Water vole is not protected by Section 9, subsection 1 of the Wildlife and Countryside Act but is covered by Section 9, subsection 4 and Section 10[2].

Wildlife and Countryside Act (1981)
Nature Conservation (Scotland) Act 2004

Under Section 9, Subsection 4, Paragraphs (a) and (b), it is an offence to:

Intentionally or recklessly damage or destroy, or obstruct access to, any structure or place which any wild animal included in Schedule 5 uses for shelter or protection.

Intentionally or recklessly disturb any such animal while it is occupying a structure or place which it uses for that purpose.

Under Section 10, Subsection 3, Paragraph (c), any person shall not be guilty of an offence by reason of:

Any act made unlawful by that section if he shows:

(a) That each of the conditions specified in subsection (3A) was satisfied in relation to the carrying out of the unlawful act; or

(b) That the unlawful act was carried out in relation to an animal bred and, at the time the act was carried out, lawfully held in captivity.

Section 3A states those conditions referred to in Subsection 3c are:

(a) That the unlawful act was the incidental result of a lawful operation or other activity;

(b) That the person who carried out the lawful operation or other activity:

(i) took reasonable precautions for the purpose of avoiding carrying out the unlawful act; or

(ii) did not foresee, and could not reasonably have foreseen, that the unlawful act would be an incidental result of the carrying out of the lawful operation or other activity; and

That the person who carried out the unlawful act took, immediately upon the consequence of that act becoming apparent to the person, such steps as were reasonably practicable in the circumstances to minimise the damage or disturbance to the wild animal, or the damage or obstruction to the structure or place, in relation to which the unlawful act was carried out.

Badger are protected under the Protection of Badgers Act 1992 (as amended by the Nature Conservation (Scotland) Act 2004 (as amended)).

The following applies under this legislation:

Part 1.–

(1) A person is guilty of an offence if, except as permitted by or under this Act, he wilfully kills, injures or takes, or attempts to kill, injure or take, a badger.

(2) If, in any proceedings for an offence under subsection (1) above consisting of attempting to kill, injure or take a badger, there is evidence from which it could reasonably be concluded that at the material time the accused was attempting to kill, injure or take a badger, he shall be presumed to have been attempting to kill, injure or take a badger unless the contrary is shown.

[1] The Conservation Amendment (Scotland) Regulations (2007) removed EPS from Schedule 5 and 8 of the Wildlife and Countryside Act 1981.

[2] as amended by the Nature Conservation (Scotland) Act 2004

(3) A person is guilty of an offence if, except as permitted by or under this Act, he has in his possession or under his control any dead badger or any part of, or anything derived from, a dead badger.

Part 3. –

(1) A person is guilty of an offence if, except as permitted by or under this Act, he interferes with a badger sett by doing any of the following things–
   (a) damaging a badger sett or any part of it;
   (b) destroying a badger sett;
   (c) obstructing access to, or any entrance of, a badger sett;
   (d) causing a dog to enter a badger sett; or
   (e) disturbing a badger when it is occupying a badger sett,
   (f) intending to do any of those things or being reckless as to whether his actions would have any of those consequences.

(2) A person is guilty of an offence if, except as permitted by or under this Act, he knowingly causes or permits to be done an act which is made unlawful by subsection (1) above.

Note: A badger sett is defined in law as any structure or place which displays signs of current use by a badger.

Pine marten are protected by the following legislation:

Wildlife and Countryside Act (1981)
Nature Conservation (Scotland) Act 2004

Under Section 9, Subsection 1, it is an offence to:

Intentionally or recklessly:

Kill, injure or take any wild animal listed on Schedule 5;

Damages or destroys or obstructs access to, any structure or place that any animal listed on Schedule 5 uses for shelter or protection;

Disturbs any such animal while it is occupying a structure or place which is uses for that purpose

Sell, offer or expose for sale, or possess or transport for the purpose of sale, any live or dead wild animal included in Schedule 5, or any part of, or anything derived from, such an animal.

Publish or cause to be published any advertisement likely to be understood as conveying that he buys or sells, or intends to buy or sell, any of those things.

Adder, slow worm and **viviparous lizard** are protected by the following legislation:

These three species of reptile are noted within Schedule 5 of the Wildlife and Countryside Act (1981). However, Schedule 5 of the 1981 act notes that these species are protected 'in respect of section 9(5) only'.

Section 9(5) states:

(5) Subject to the provisions of this part, if any person-

(a) Sells, offers or exposes for sale, or has in his possession or transports for the purpose of sale, any live or dead wild animal included in Schedule 5, or any part of, or anything derived from, such an animal; or
(b) Publishes or causes to be published any advertisement likely to be understood as conveying that he buys or sells, or intends to buy or sell, any of those things.

he shall be guilty of an offence

An amendment was made to Schedule 5 on 18 March 1988 relating to slow worm and viviparous lizard to give them protection under Section 9(1). A further amendment was made to Schedule 5 on 27 March 1991 relating to adders which afford them protection under Section 9(1).

Section 9(1) (as amended by the Nature Conservation (Scotland) Act 2004) states:
'Subject to the provisions of this Part, if any person intentionally or recklessly kills, injures or takes any wild animal included in schedule 5, he shall be guilty of an offence.'

Annex heading is 12 pt, bold and all capitals with 12 pt space below. Annexes are A, B, C etc.

If you need to caption tables in the Annex, you will need to modify the table label.

1. Select the table then right click to add the caption.
2. Create a new label for Annex A. This will be Table A- and your tables will be called Table A-1, Table A-2 etc.
3. You will need to create a new label for any tables in Annex B (Table B-)
4. The you will need to add these to the List of Tables in contents page. Go to the References tab.

ANNEX B. SURVEY RESULTS

Year	Species	Sign	Grid reference	Within Site Boundary	Notes	Photo
2019	Badger	Potential print	ND 06852 67858	Yes	Potential badger print. Outline of print could possibly be badger but no detail in the print to make a confirmed identification.	
2018	Mammal	Hole	ND 06440 68126	Yes	Mammal hole in raised section of ground covered by rush. Entrance overgrown with tall grass, however tunnel very clear into peaty soil. Entrance and tunnel both large and of a size that would support badger. Few old rabbit droppings inside.	4
			ND 06441 68130		Adjacent to other mammal holes. Entrance and tunnel of a size that would support badger, however entrance overgrown indicating no recent use. Tunnel itself is clear, and contains potential bedding however this may be old vegetation that has been blown into hole. Tunnel narrows like a rabbit run however size still suitable to accommodate badger.	
			ND 06441 68124		Third mammal hole in locality. This hole has collapsed and does not enter a further cavity. Similarly, overgrown entrance. Initial aperture of a size that would accommodate badger, however shape more akin to that of a warren.	
2018	Mammal	Hole	ND 05833 68740	Yes	Old hole that may have been used by a mammal at some point. Quickly narrows into small aperture. Possibly used by stoat/weasel or previously rabbit.	
2018	Mammal	Hole	ND 05713 68694	Yes	Small mammal hole. No suitability for badger or any other protected species.	
2018	Mammal	Hole	ND 05765 68762	Yes	Rabbit warren.	
2019	Mammal	Hole	ND 06585 67155	No	Mammal hole. Singular hole with no spoil heap or sign of mammal activity. Size and structure suitable for supporting badger. Area with lots of disturbance from sheep.	
2018	Reptile	Potential hibernaculum	ND 06435 68124	Yes	Old stone ruin. Potential hibernaculum.	3
2019	Reptile	Potential hibernaculum	ND 06787 67422	No	Long stone wall with elevated shelter above water table for a hibernating lizard. Feature assessed as having moderate suitability for hibernaculum.	
2019	Reptile	Potential hibernaculum	ND 06826 67462	Yes	Low stone wall with a few elevated sheltered crevices for a hibernating lizard. Feature assessed as having low suitability for hibernaculum.	
2019	Reptile	Potential hibernaculum	ND 06841 67287	No	Pile of quarry stones which are low to the ground. A few elevated sheltered crevices present. Feature assessed as having low suitability for hibernaculum.	
2019	Reptile	Potential hibernaculum	ND 06851 67217	No	Quarry with an area of quarry slabs that are piled up in heaps and scattered throughout quarry. Elevated sheltered crevices present. Features assessed as having low to moderate suitability for hibernaculum.	
2019	Reptile	Potential hibernaculum	ND 06918 67303	Yes	Area of the quarry with scattered piles of rock with crevices present. Features assessed as having low to moderate suitability for hibernaculum.	

ANNEX C. PHOTOGRAPHS

Photo 1. Picture of typical habitat within the study area.

Photo 2. Picture of a typical watercourse/drain within the study area. Note high modification.

Photo 3. Potential hibernacula west of T5

Photo 4. One of three mammal holes with potential to support badger

Photo 5. Best fish habitat on the site. This short section is typically <5 cm deep and flowing over hard bedrock.

Photo 6. Main tributary of Burn of Brims.

Photo 7. Burn of Brims flowing underneath piped culvert.

Cairnmore Hill Wind Farm

Bat Survey Report

Technical Appendix 7.3

Date: 16 May 2022

Tel: 0141 342 5404

Web: www.macarthurgreen.com

Address: 93 South Woodside Road |Glasgow | G20 6NT

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1 INTRODUCTION

MacArthur Green was commissioned by RES Ltd ('the Applicant') to carry out the relevant bat survey and assessment work to inform the ecological assessment for the proposed Cairnmore Hill Wind Farm's (hereafter referred to as the 'Proposed Development') Environmental Impact Assessment (EIA).

This report was previously submitted in support of the Ecological Impact Assessment for Cairnmore Hill Wind Farm original planning application (2019). It has been updated to include the relevant results and output from the Ecobat online tool which has been used to further analyse the 2016 bat activity data. The results can be found in Annex F.

In summary the following bat survey and assessment work has been completed:

- Baseline bat surveys were conducted for the site by Caledonian Conservation Ltd. in 2014. Detailed results are contained within Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. MacArthur Green completed additional bat activity surveys in 2016 as detailed within this report.
- Bat activity surveys completed by Caledonian Conservation in 2016. MacArthur Green analysed this data for the original 2019 application and have undertaken further analysis using the Ecobat Tool for this new application.
- A preliminary bat roost assessment was carried out by MacArthur Green in 2016 to update the baseline roost surveys carried out by Caledonian Conservation Ltd. in 2014.

2 THE SITE

The Proposed Development comprises of up to five wind turbines and associated infrastructure. The site covers an area of approximately 3.58 km2. The site is located approximately 4.5 km west of Scrabster on the north coast of Caithness, in the Scottish Highlands.

The site is low lying, with its highest point lying 138 m above sea level at Hill of Forss which is within the centre of the site. The southern central area of the site is a level plateau area of relatively shallow peatland extending over Lythmore Moss, which is characterised by heavily grazed and degraded wet heath and wet modified bog. The edges of the site are underlain by mineral soils, and are dominated by semi-improved grasslands, improved pasture and fields ploughed and used for crops. There is no woodland present or linear features such as hedgerows or tree lines within the site. The field boundaries are delimited by stone walls and fence lines with occasional low growth gorse. There are a number of small watercourses present within the site, many of which feed into the Burn of Brims.

Notable habitats for foraging and commuting bats were a small pond at Hill of Forss and a small number of minor watercourses. These features were noted to have low suitability for foraging and commuting bats due to their exposed nature, disturbance from grazing and limited vegetation cover.

A bat roost assessment study area of 300 m from turbines and 30 m from the proposed access track layout at the time of survey was surveyed. The 300 m buffer from turbines took into account the recommended survey distance of 200 m plus rotor radius, with a proposed rotor radius of 58.5 m, as per Scottish Natural Heritage (SNH) et al. (2019) guidance. The study area was increased from 258.5 m to 300 m to account for any proposed micro-siting of turbines.

3 SURVEY DETAILS & CONSTRAINTS

The initial habitat surveys carried out by Caledonian Conservation Ltd were conducted in July and August 2014, details of which are provided in Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm.

The verification walkover survey and additional NVC and habitat surveys conducted by MacArthur Green were carried out from 27th to 29th August 2018 inclusive; a further small additional area was surveyed on 5th and 6th March 2019. It is recognised that the surveys in March 2019 are not in the optimal period for vegetation surveys, however the area surveyed was a small extension of areas already mapped and familiar to the surveyor with all communities still readily identifiable, as such the timing of the survey was not considered a limitation. The entire study area was accessible and there were no access restrictions.

The NVC system does not cover all possible semi-natural vegetation or habitat types that may be found. Since the NVC was adopted for use in Britain in the 1980s, further survey work and an increased knowledge of vegetation communities has led to additional communities being described that do not fall within the NVC system, particularly under-described vegetation communities of remote areas. Where such communities are found and recorded, they are given a non-NVC community code and are described.

It should be noted that the results from this survey, and the matches made in describing communities, represent a current community evaluation at the time of survey (as opposed to one seeking to describe what the community was before any human interference, or what it might become in the future). In light of this, a clear constraint of the vegetation survey and evaluation process as used in this and other surveys is that it offers only a snapshot of the vegetation communities present and should not be interpreted as a static long-term reference. Ecological surveys are limited by factors which affect the presence of plants such as the time of year and weather. The ecological surveys undertaken to support the Proposed Development have not therefore produced a complete list of plants, and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, the results of these surveys have been reviewed and are considered to be sufficient to undertake the assessment.

4 LEGAL PROTECTION

All bat species are protected under the following legislation:

- The Habitats Directive 92/43/EEC (as amended);
- The Wildlife and Countryside Act 1981 (as amended); and
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

Details pertaining to the legal status of bats are included within Annex A and in Table A-1.

In the UK and Europe, guidelines have been produced with regards to assessing the ecological impact upon bats from wind farm developments. These guidelines help to inform survey and mitigation strategies.

The following guidance documents have been used in the preparation of this report:

- Collins, J. (ed) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London; and

- Scottish Natural Heritage, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT). (2019). *Bats and Onshore Wind Turbines: Survey Assessment and Mitigation*.

5 METHODS

A preliminary bat roost assessment of potential roost features within the bat roost assessment study area was carried out to record the presence or likely absence of bats on the 6th March 2019. The bat roost assessment study area is shown in Figure 7.6. The daytime inspection was carried out in accordance with Collins (2016) guidance. All potential access points and potential roost features (PRF) that could be used as a roost were noted and features such as droppings, worn marks, stain marks, areas cleared of cobwebs and insect remains were also noted.

Bat activity surveys were completed by Caledonian Conservation in 2016. These used static Anabat detectors at four areas (A, B, C and D) during recording sessions in May, July/August and September 2016, for a minimum of five nights per recording session.

6 LIMITATIONS

It was not safe to carry out an internal inspection of Blackheath property due to the unstable structure of the roof on the bungalow and on the barn. Some of the stone walls around the property were also unstable. Internal access into Hopefield house which is an occupied residential dwelling was not possible at the time of survey.

The daytime inspection did not cover the maternity, transitional, satellite, mating and feeding roost periods, as shown in Table 6-1 of Section 6. However, preliminary bat roost assessment of buildings can be carried out at any time of year, as signs of bat occupancy such as bat droppings can be found throughout the year in buildings.

7 ROOST TYPES

In the course of a year, bats will utilise different types of roosts according to their requirements and the season. Table 6-1 has been adapted from BCT guidance (Hundt, 2012) and provides a list of roost types. Bats in general are faithful to roost sites and return year after year.

Table 6-1 *Roost Types (adapted from Hundt, 2012)*

Roost Type	Months of Occupation	Description
Transitional roost	April - September & October	Transitional roosts are used when bats commute to and from hibernation. They are used infrequently by individuals or a small group of bats for short periods of time i.e. few days or several weeks.
Maternity roost	May - August	Breeding females occupy these roosts around the beginning of May. Birth occurs between June and July with females and young remaining within the roost until July – August. Adult males can occasionally be found in these roosts.
Satellite roosts	May - August	Breeding females may have alternative roosts in proximity to the maternity roost. The number of bats using this roost can vary.
Mating roost	September - November	Mating takes place after females leave maternity roosts and prior to hibernation. Males of some species establish mating roosts.
Night time roost	March - November	These roosts are used occasionally by bat species at night. They can be used by a single individual or regularly by a whole colony.
Day roost	March - November	These are typically used by male bats alone or in small groups with other males. Bats may use a number of these roosts switching from them occasionally or frequently.
Feeding roost	May - November	These are also referred to as perching roost, with some bat species catching moths and roosting to feed. These roosts can be identified by uneaten prey items such as moth wings. These roosts are used by brown long eared bats (*Plecotus auritus*).
Hibernation roosts	October - March	Bats hibernate during the winter to conserve energy when prey availability is low. The temperature for a hibernation roost needs to be stable and approx. 0 – 6 degrees.

8 RESULTS AND DISCUSSION

8.1 Review of 2014 Baseline Bat Survey Results

Caledonian Conservation Ltd. carried out bat surveys in 2014 at the site. Bat surveys were designed based on consultation between Caledonian Conservation Ltd and SNH[1]. A full overview of the results is contained within Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm.

The spatial surveys only recorded one bat pass in September 2014 which was a Natterer's bat (*Myotis nattereri*). The temporal surveys recorded a total of 108 bat passes with four bat species recorded; common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus)*, Daubenton's (*Myotis daubentonii*) and Natterer's. One genus group (*Myotis* spp.) was also recorded. Common and soprano pipistrelle bats made up 96.3% of the species recorded on-site. The activity levels for all species recorded on the site was assessed to be low with the habitats determined to be sub-optimal for bats.

Following a review of the Caledonian Conservation Ltd. baseline bat data in conjunction with the National Vegetation Classification (NVC) data that was collected by MacArthur Green in 2018, it was concluded that no significant habitat change had occurred to the site since the bat surveys were carried out in 2014. When also taking into consideration the geographical location of the site which is out with the range of high collision risk species such as *Nyctalus* spp., it was determined that the likelihood of bat activity levels having significantly changed since 2014 was low to negligible. SNH was consulted regarding the validity of using the 2014 baseline

[1] SNH letter dated the 29th April 2014.

bat data for the ES, but with proposals to update the roost survey result in 2019. SNH agreed that the 2014 baseline bat data was relevant for the site and could be used to inform the EIA[2].

Following on from this consultation, temporal bat survey data for the site which was recorded in 2016 by Caledonian Conservation Ltd. was analysed by MacArthur Green. The data was recorded using static Anabat detectors at four areas (A, B, C and D) during recording sessions in May, July/August and September 2016, for a minimum of five nights per recording session. 21 registrations of common pipistrelle were recorded during the total of 105 recording nights. Analysis was undertaken using Kaleidoscope 4 Auto ID classifier and verification of results by an experienced bat expert using Kaleidoscope Viewer and AnalookW 4.3.19 software. A summary table of the bat survey data is presented in Annex C. The results of the 2016 bat surveys correspond with the 2014 low bat activity assessment of the site.

In line with SNH *et al*. (2019), further analysis of bat data was carried out in 2022 using the secure online tool Ecobat (Mammal Society, 2017), to gain a measure of relative bat activity at the site. Ecobat data was then evaluated in accordance with SNH *et al.* (2019) guidance to determine the overall site risk level. The Ecobat analysis automatically analyses data per month and not per season. The results are presented based on this analysis per month.

In summary:

- In 2016 one bat species was recorded (Common pipistrelle having 21 passes).
- The species recorded is considered a high collision risk species.
- Low risk species are scoped out of EIA assessments (not applicable at this site).

The Ecobat reports go into a lot of detail on bat activity percentiles and ranking of these to give a relative measure of the activity level for the site, compared to other sites that have submitted data within the reference range, same survey period and so on. At a very high level, the site risk assessment from this indicates that the site is Low sensitivity when the Median percentile and Maximum percentile is used.

From this initial review of the data, we do not think there is a significant bat risk at the Proposed Development, particularly if now standard mitigation was applied. This mitigation, as per SNH et al. (2019) guidance includes:

- Standard 50m blade tip to feature separation – this particularly applies to the forestry edges; and
- Standard Reduced Rotation Speed whilst idling mitigation as detailed within section 7.1.3 of SNH *et al*. (2019). There is no loss of wind farm output with these measures.

We do not believe any curtailment measures would be required at this site.

Bat species recorded 2016, Percentile Activity Level and associated activity level category (Table 8 in Ecobat)

Bat Spp	Median Percentile	Maximum Percentile
Common pipistrelle	0 – Low activity	55 - Moderate activity

High Collision Risk Species:

- As there were no low collision risk species, none needed to be scoped out of the assessment.

Likely Site Risk Categorisation

- Low risk due to habitat features having low suitability for foraging and commuting bats and assumed size of development of less than 10 turbines.

2016 – Overall Site Risk Assessment

Bat Spp	Median Percentile	Maximum Percentile
Common pipistrelle	Low (0)	Low (3)

Species

Emergence times and Bat Roosts

There were no records of bat activity which coincide with bat emergence times.

8.2 Blackheath Property

Blackheath property is situated at an altitude of 124 m. It is surrounded by arable land, farmland, bog and upland grassland communities which are intensively grazed by sheep. Connectivity to the surrounding area is poor with field boundaries devoid of trees and composed of wire fence lines with the occasional presence of gorse and stone walls. Foraging habitat in the immediate area is poor with a small open pond at Hill of Forss and open drainage channels which have low foraging and commuting suitability.

The property consists of a derelict stone bungalow with a stone barn (See photos 1 to 5 in Annex D). The property is surrounded by stone walls and there are two out-buildings in the southwestern section of the property. The bungalow is missing approximately half of the roof with the remaining roof unstable and prone to collapse. The windows and doors are open. There are three chimneys present which have cracks and crevices in the stonework. The roof has slate tiles which have numerous gaps.

The barn has a portion of its roof missing with the roof present in the eastern gable end, and the western section of the roof is completely open to the elements. The roof has wooden rafters and sarking with some of the wooden rafters broken. The roof has slate tiles with numerous gaps. An internal inspection could not be completed due to the unstable nature of the barn roof, however it could be seen from the open door that the gap between the stone wall and the wooden rafters at the gable end, did not offer suitable shelter for bats with open gaps in the roof directly above with light spill. The rest of the barn roof looked to be open with a lack of crevices.

Throughout the property there were numerous suitable gaps for a bat roost within the stonework of the bungalow, barn, out-buildings and surrounding stone walls.

The property was assessed as having moderate roost suitability. It is likely that the property could support a transitional roost. The occurrence of a maternity roost at the property is likely to be low due to the derelict nature of the property and the lack of structural roost features that would be large and sheltered enough to support a maternity roost. The likely presence of a hibernation roost may be possible due to suitable crevices within the stone walls and stone chimneys.

[2] SNH email dated the 21st March 2019.

Over time if no maintenance work to the property takes place, the unstable roof structures which are already damaged and open to the elements with broken beams would collapse further. The stonework on some of the walls which are leaning would also start to collapse. The property would over time become less suitable for bat roosts.

8.3 Hopefield House

Hopefield House is situated in the southeast of the bat roost assessment study area and is at an altitude of 108 m. It is surrounded by arable land, a quarry and semi-improved grassland. Connectivity to the surrounding area is poor with field boundaries devoid of trees and composed of wire fence lines. The property consists of an occupied bungalow with rendering on the walls. There is a small extension in the southern section of the bungalow which has wooden fascia with gaps in the fascia. The roof consists of slate tiles with some small gaps under the tiles. Attached onto the back of the bungalow there is a shed composed of breeze blocks which has a collapsed roof (refer to photos 6 to 10 in Annex D).

There are two stone barns adjacent to the property which have slate roofs. These barns have some gaps in the roof with slate tiles missing. There is also a corner of the wall in one of the barns which has started to collapse with a large gap allowing direct access into the barn. It could be seen through this large gap that there is a small upper floor to this barn.

There is a large open corrugated metal shed adjacent to these barns.

The bungalow and the two barns were assessed as having moderate roost suitability for bats. The shed with the collapsed roof and the corrugated metal shed both have negligible roosting opportunities. The occurrence of all bat roost types including a maternity roost in the bungalow and in the stone barns is moderate. The presence of a hibernation roost may be possible due to the stone walls of the barns.

Over time if no maintenance work to the property takes place, the missing tiles on the barns would get worse with more of the roof opening up to the elements, with the barns over time becoming less suitable for bat roosts.

8.4 Stone Ruin

There is a stone ruin located 433 m southwest of Hopefield House (refer to photo 11 in Annex D). The stone ruin was recorded as a target note as it is adjacent to the bat roost assessment study area. The stone ruin is situated in a field which is surrounded by arable and semi-improved grassland. The stone ruin does not have a roof and consists of stone walls which at their highest are approximately 2 m high and at their lowest are approximately 0.2 m high. There are limited small gaps and cavities within the stone work with debris present within the cavities. The stone ruin was assessed to have negligible roost suitability.

9 DISCUSSION

The Blackheath property and Hopefield House were both assessed as having moderate roost suitability. A stone ruin which is adjacent to the bat roost assessment study area was assessed as having negligible roost suitability.

SNH *et al.* (2019) guidance recommends bat roost surveys when a potential roost feature is within 200 m plus rotor radius of a wind turbine. The following equation from SNH *et al.* (2019) was used to determine the buffer distance; $b = \sqrt{(200\text{ m} + bl)^2 - (hh - fh)^2}$ (see Annex E below). Using this equation, the buffer was calculated to be 244.13 m. In a previous revision of the proposed site layout, Turbine 8 fell 3.56 m within this bat roost exclusion buffer around Blackheath property, which prompted further consultation with SNH to address this as a potential constraint. In the current proposed layout, turbine 5 falls 22.39 m within the calculated bat roost exclusion buffer around Blackheath property. However, with the added context of bat activity in the area provided through the Ecobat tool, it is considered unlikely that this potential roost feature is in use. The Overall Site Risk Assessment for bats was deemed to be Low at both the median and maximum percentile levels, and an analysis of the bat activity compared with known emergence times suggests that there are no roosts in the area.

Additionally, a previous layout proposed a borrow pit utilising an existing quarry to the south of the site. This may have resulted in the requirement for buffer zones of either 30 m or 100 m around Hopefield House, depending on stone extraction methods. The revised layout has eliminated this risk to bats by removing any proposed works in this area (see Chapter 3: Site selection, Design Evolution and Alternatives).

10 CONCLUSIONS

Although there is a potential roost feature with 244.13 m of a turbine, it is considered that there is negligible risk to bats from the Proposed Development. However, in the event that any micrositing of infrastructure and/or turbines is required, a suitably experienced ecologist should be consulted to re-evaluate the risk of disturbance to bats, and advise on the appropriate mitigation for the proposed works.

If further bat survey work is required under these circumstances, then bat surveys must be carried out in accordance with best practice guidance (Collins, 2016) with the appropriate number of bat surveyors covering all potential roost features during activity surveys.

11 REFERENCES

Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn.). The Bat Conservation Trust, London. ISBN-13 978-1-872745-96-1.

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Mammal Society (2017). *Ecobat*. Available at: http://www.mammal.org.uk/science-research/ecostat/

SNH, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT). (2019). *Bats and Onshore Wind Turbines: Survey Assessment and Mitigation*. Available online at https://www.nature.scot/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation.

ANNEX A. LEGAL PROTECTION

All bat species receive protection under the Conservation Regulations (1994) (as amended).

The information contained in this Annex is a summarised version of the legislation and should be read in conjunction with the appropriate legislation as set out in its complete form.

It is an offence to:

- Deliberately or recklessly to capture, injure or kill a wild animal of a European protected species;
- Deliberately or recklessly:
    - Harass a wild animal or group of wild animals of a European protected species;
    - Disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;
    - Disturb such an animal while it is rearing or otherwise caring for its young;
    - To obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place (i.e. roost sites);
    - To disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; or
    - To disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.
- To damage or destroy a breeding site or resting place of such an animal.

ANNEX B. PRELIMINARY BAT ROOST SURVEY RESULTS

TN	Species	Sign	Grid reference	Notes	Photo
1	Bats	Building	ND 07062 68362	Blackheath property. The property was assessed as having moderate roost suitability.	1-5
2	Bats	Building	ND 07163 67577	Hopefield House. The property was assessed as having moderate roost suitability.	6-10
3	Bats	Building	ND 06996 67154	Stone ruin. The feature was assessed as having negligible roost suitability.	11

ANNEX C. ANALYSED TEMPORAL DATA 2016

Detector	Data Folder	Start Date	End Date	Number of Nights	Species	Registrations	Bat Activity Index (brpn*)	X	Y	Easting	Northing
12M	LocA_v1	08-05-16	12-05-16	5	0	0	0.000	58.59567	-3.6034	306906	968635
12A	LocA_v2	20-07-16	03-08-16	14	*Pipistrellus pipistrellus*	8	0.571	58.59668	-3.60252	306960	968746
4S	LocA_v3	22-09-16	03-09-16	7	*Pipistrellus pipistrellus*	2	0.286	58.59619	-3.60296	306933	968692
13M	LocB_v1	08-05-16	12-05-16	5	0	0	0.000	58.59399	-3.61443	306260	968463
13A	LocB_v2	20-07-16	03-08-16	14	*Pipistrellus pipistrellus*	4	0.286	58.59397	-3.61438	306263	968461
13S	LocB_v3	22-09-16	06-10-16	10	0	0	0.000	58.59397	-3.61438	306263	968461
10M	LocC_v1	08-05-16	12-05-16	5	0	0	0.000	58.58863	-3.62202	305805	967877
4A	LocC_v2	20-07-16	03-08-16	14	*Pipistrellus pipistrellus*	2	0.143	58.58859	-3.6219	305812	967872
10S	LocC_v3	22-09-16	06-10-16	10	0	0	0.000	58.58857	-3.62177	305819	967870
11M	LocD_v1	08-05-16	12-05-16	5	0	0	0.000	58.58747	-3.61438	306246	967737
10A	LocD_v2	20-07-16	31-07-16	11	*Pipistrellus pipistrellus*	5	0.455	58.58743	-3.61436	306247	967732
8S	LocD_v3	22-09-16	27-09-16	5	0	0	0.000	58.58746	-3.61439	306245	967736
Total				**105**		**21**	**0.200**				

*Bat Registration Per Night = Registrations/Survey Nights

ANNEX D. PRELIMINARY BAT ROOST PHOTOGRAPHS

Photo 1. Blackheath Property

Photo 2 Blackheath Farmhouse bungalow (east facing)

Photo 3 *Blackheath Farm house bungalow (north facing)*

Photo 4 Blackheath stone walls

Photo 5 Blackheath Barn – Eastern section of the barn with roof

Photo 6 Hopefield bungalow

Photo 7 Hopefield adjacent shed

Photo 8 Hopefield stone barns

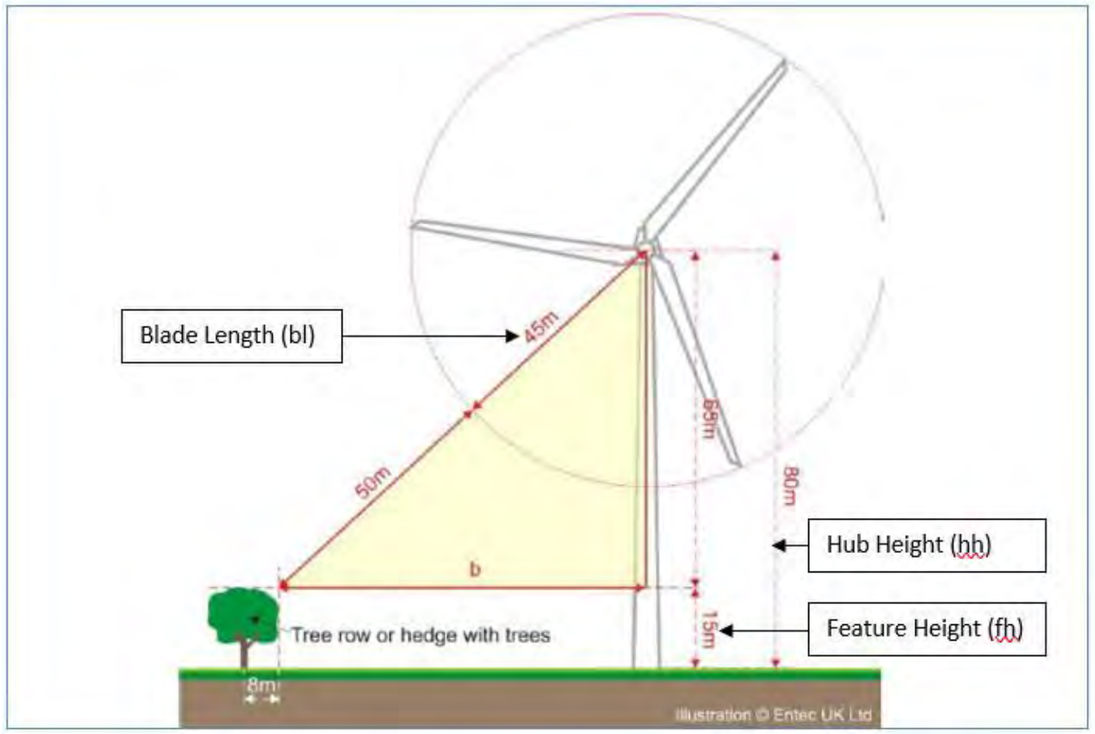
Photo 9. Hopefield barn - corner of barn with large access area into the barn

Photo 10. Hopefield stone barn with missing tiles

Photo 11. Stone ruin

ANNEX E. ILLUSTRATION TO SHOW BUFFER ZONE CALCULATION

Taken from Natural England (2014) and SNH *et al* (2019)



This report was produced free of charge by the Mammal Society to support evidence-based conservation of bats.

The following analyses are based on data supplied by the user to the Mammal Society's Ecobat website. The outputs are designed to assist decision-making, but do not replace expert interpretation by the user. The creation of the Ecobat tool was supported by the Natural Environment Research Council (NERC).

Bat Activity Analysis
Site Name: Cairnmore Hill

Author: MacArthur Green

21/04/2022

1 SUMMARY

Bats were detected on **9** nights between **2016-07-22** and **2016-10-01**, using **5** static bat detectors. Throughout this period **1** species were recorded. **Table 1.** Detectors were placed at the following locations:

Detector ID	Latitude	Longitude
LocA_v2	58.59667	-3.602520
LocB_v2	58.59396	-3.614389
LocD_v2	58.59667	-3.602537
LocC_v2	58.58857	-3.621899
LocA_v3	58.59618	-3.602962

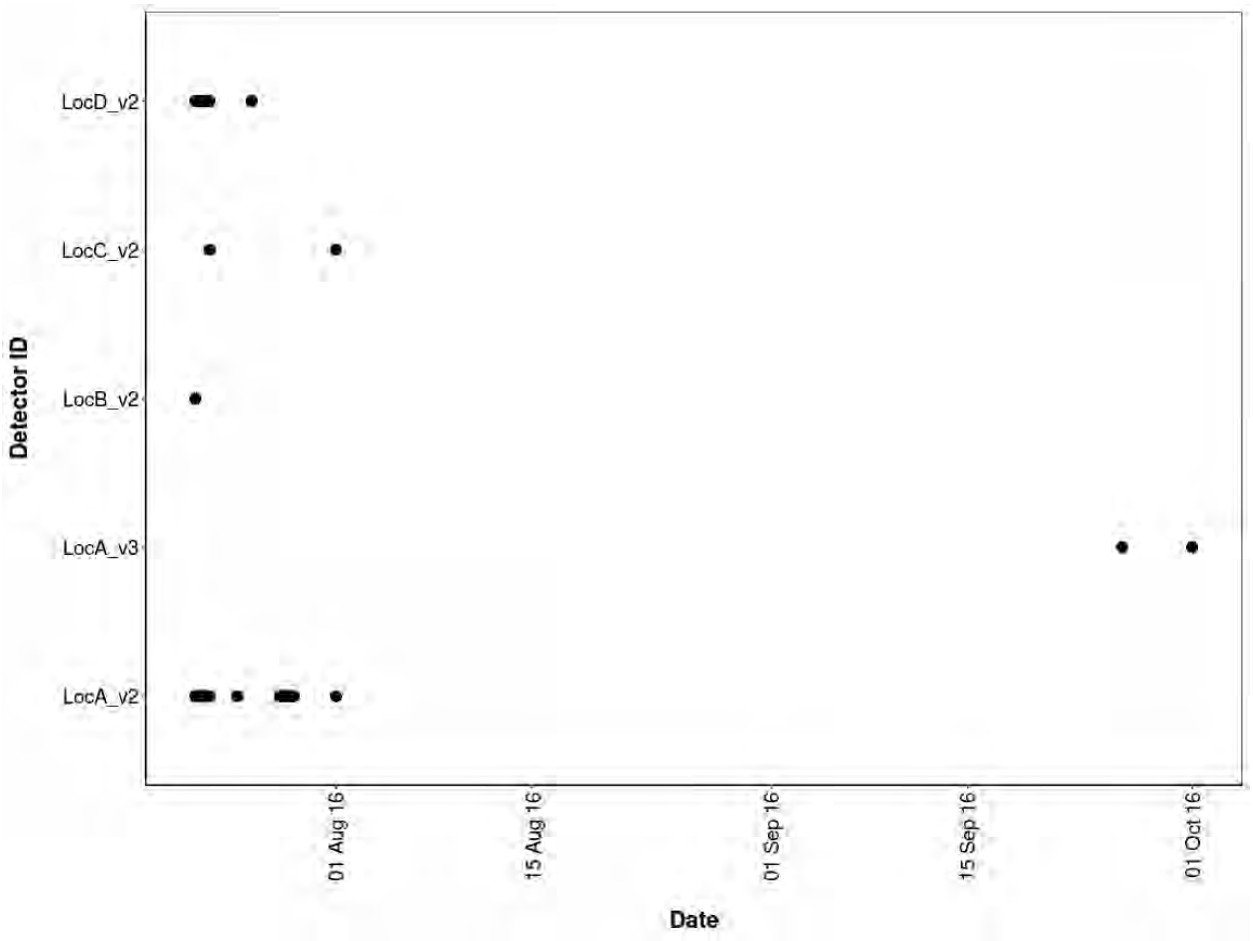
2 SURVEY NIGHTS

Table 2. The number of nights that bats were detected on each recorder. This is not the same as the number of nights that detectors were active if there were nights when no bats were detected.

Detector ID	No. of nights
LocA_v2	6
LocA_v3	2
LocB_v2	2
LocC_v2	2
LocD_v2	3

3 SURVEY NIGHTS

Figure 1. Horizontal bars show nights when acoustic detectors recorded bats.



3.1 PART 1: Percentiles Analysis

This first part of the analysis looks at the relative activity levels of the bats you recorded. We take your value for the total bat passes each night for each species, and compare this to the values in our reference database. We tell you what percentile your data falls at, and therefore what the relative activity level is. For example, if the reference database has values of 5, 10, 15, 20 and you submit a value of 18, this will be the 80th percentile, and be classed as high activity.

The reference range dataset was stratified to include:

- Only records from within 30 days of the survey date.
- Only records from within 100km radius of the survey location.
- Records using any make of bat detector.

3.2 PER DETECTOR

Table 3. Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

Detector ID	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
LocA_v2	*Pipistrellus pipistrellus*	0	0	1	0	5
LocA_v3	*Pipistrellus pipistrellus*	0	0	0	0	2
LocB_v2	*Pipistrellus pipistrellus*	0	0	1	0	1
LocC_v2	*Pipistrellus pipistrellus*	0	0	0	0	2
LocD_v2	*Pipistrellus pipistrellus*	0	0	0	2	1

Table 4. Summary table showing key metrics for each species recorded. The reference range is the number of nights for each species that your data were compared to. We recommend a Reference Range of 200+ to be confident in the relative activity level.

Detector ID	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
LocA_v2	*Pipistrellus pipistrellus*	0	0 - 0	55	6	2377
LocA_v3	*Pipistrellus pipistrellus*	0	0 - 0	0	2	2377
LocB_v2	*Pipistrellus pipistrellus*	28	27.5 - 27.5	55	2	2377
LocC_v2	*Pipistrellus pipistrellus*	0	0 - 0	0	2	2377
LocD_v2	*Pipistrellus pipistrellus*	40	40 - 40	40	3	2377

Figure 2. The recorded activity of bats during the survey. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity)

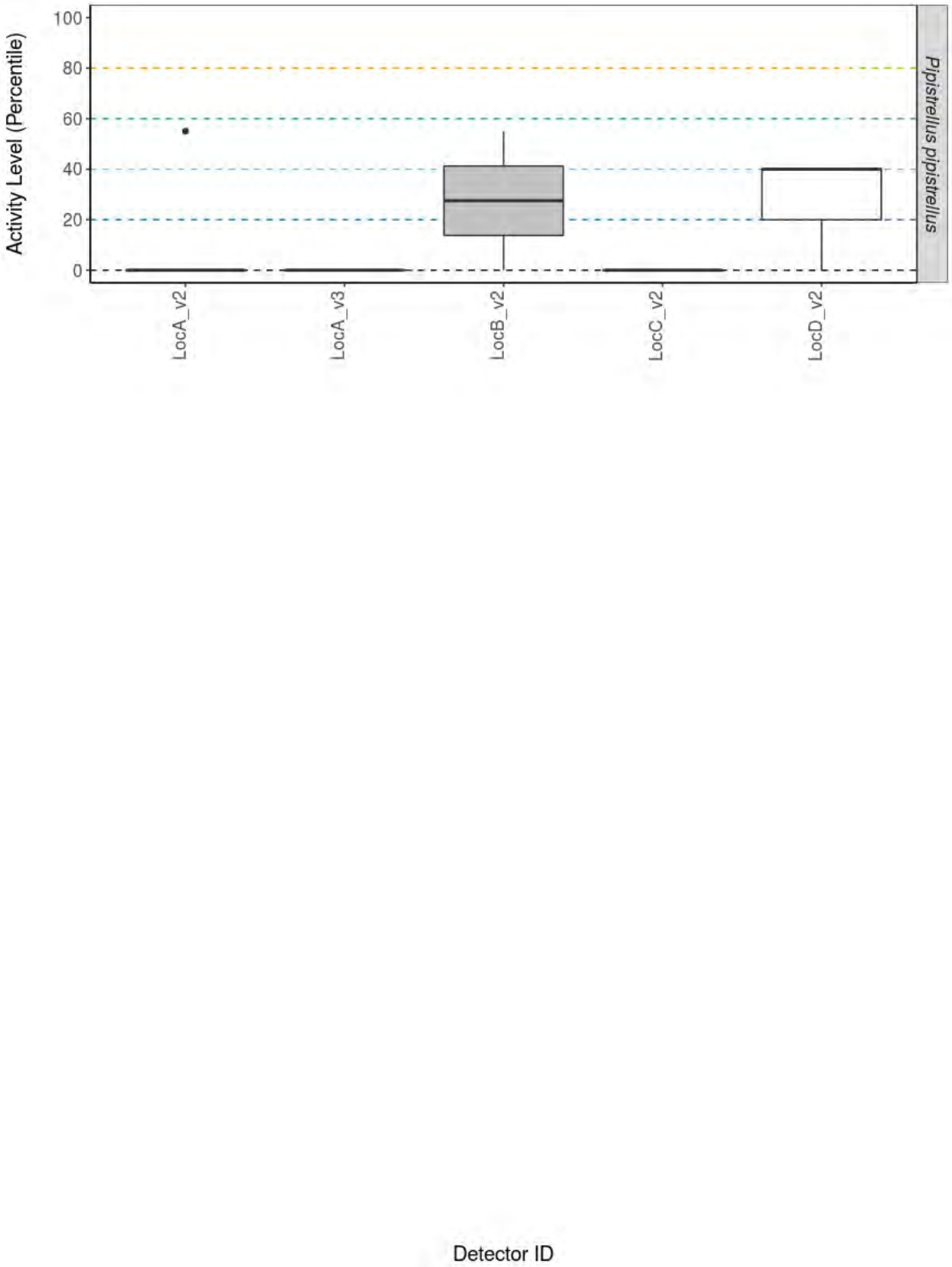
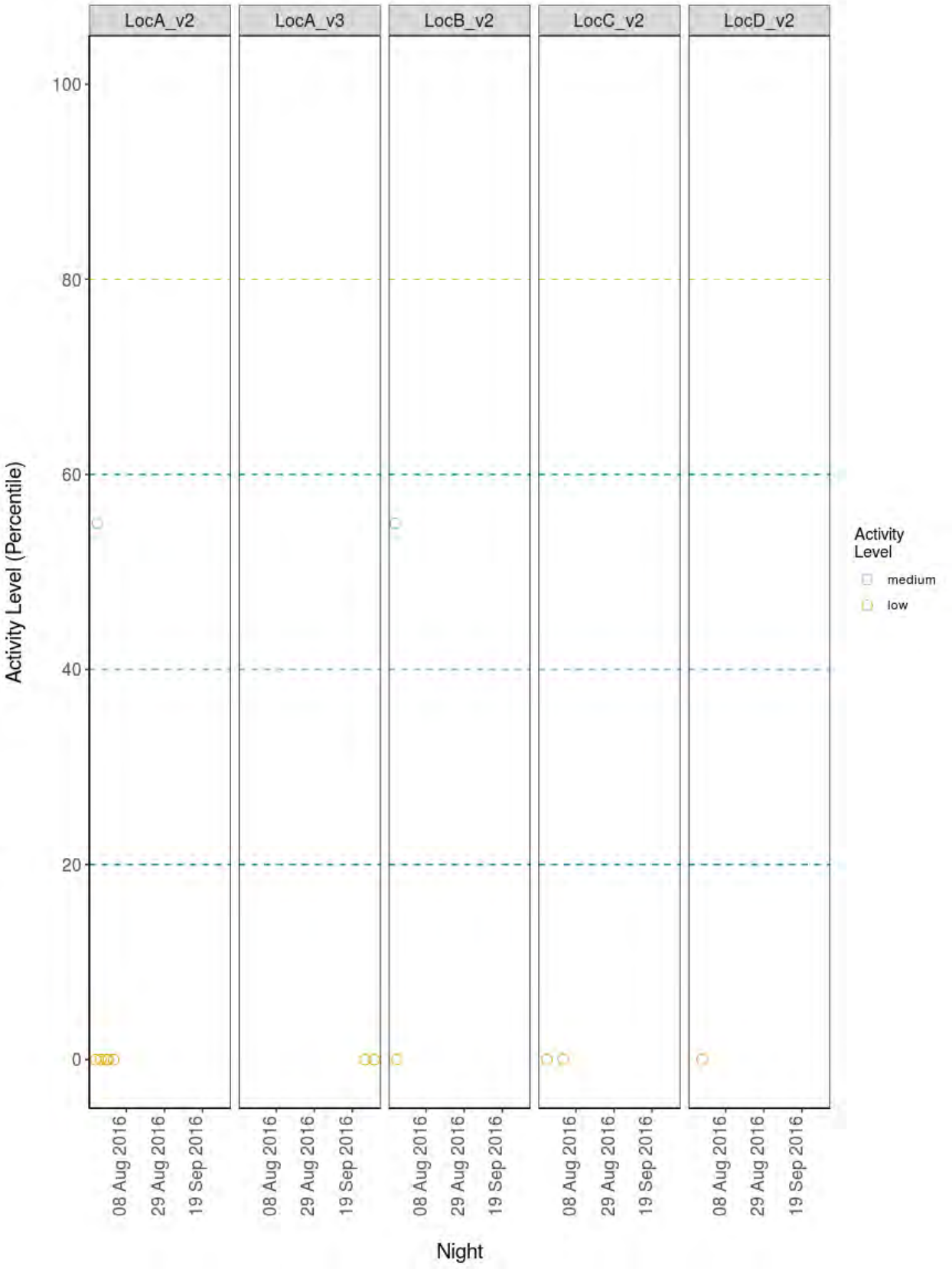


Figure 3. The activity level (percentile) of bats recorded across each night of the bat survey.


LocA_v2
LocA_v3
LocB_v2
LocC_v2
LocD_v2
Activity Level (Percentile)
100
80
60
40
20
0
08 Aug 2016
29 Aug 2016
19 Sep 2016
Night
Activity Level
medium
low

3.3 PER DETECTOR, PER MONTH

Table 5. Summary table showing the number of nights recorded bat activity fell into each activity band for each species at each detector during each month.

Detector ID	Species/Species Group	Month	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
LocA_v2	*Pipistrellus pipistrellus*	Jul	0	0	1	0	4
LocA_v2	*Pipistrellus pipistrellus*	Aug	0	0	0	0	1
LocA_v3	*Pipistrellus pipistrellus*	Sep	0	0	0	0	1
LocA_v3	*Pipistrellus pipistrellus*	Oct	0	0	0	0	1
LocB_v2	*Pipistrellus pipistrellus*	Jul	0	0	1	0	1
LocC_v2	*Pipistrellus pipistrellus*	Jul	0	0	0	0	1
LocC_v2	*Pipistrellus pipistrellus*	Aug	0	0	0	0	1
LocD_v2	*Pipistrellus pipistrellus*	Jul	0	0	0	2	1

Table 6. Summary table showing key metrics for each species recorded per month. Please note that we cannot split the reference range by month, hence this column is not shown in this table.

Detector ID	Species/Species Group	Month	Median Percentile	95% CIs	Max Percentile	Nights Recorded
LocA_v2	*Pipistrellus pipistrellus*	Jul	0	0 - 0	55	5
LocA_v2	*Pipistrellus pipistrellus*	Aug	0	0 - 0	0	1
LocA_v3	*Pipistrellus pipistrellus*	Sep	0	0 - 0	0	1
LocA_v3	*Pipistrellus pipistrellus*	Oct	0	0 - 0	0	1
LocB_v2	*Pipistrellus pipistrellus*	Jul	28	27.5 - 27.5	55	2
LocC_v2	*Pipistrellus pipistrellus*	Jul	0	0 - 0	0	1

LocC_v2	*Pipistrellus pipistrellus*	Aug	0	0 - 0	0	1
LocD_v2	*Pipistrellus pipistrellus*	Jul	40	40 - 40	40	3

3.4 PER SITE

In this 'Per Site' section of the analysis, all values are taken from across all of the detectors to provide site-wide averages/medians.

Table 7. Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Pipistrellus pipistrellus	0	0	2	2	11

Table 8. Summary table showing key metrics for each species recorded.

Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded
Pipistrellus pipistrellus	0	40 - 40	55	15

Figure 4. The activity level (percentile) of bats recorded across each night of the bat survey for the **entire site**.

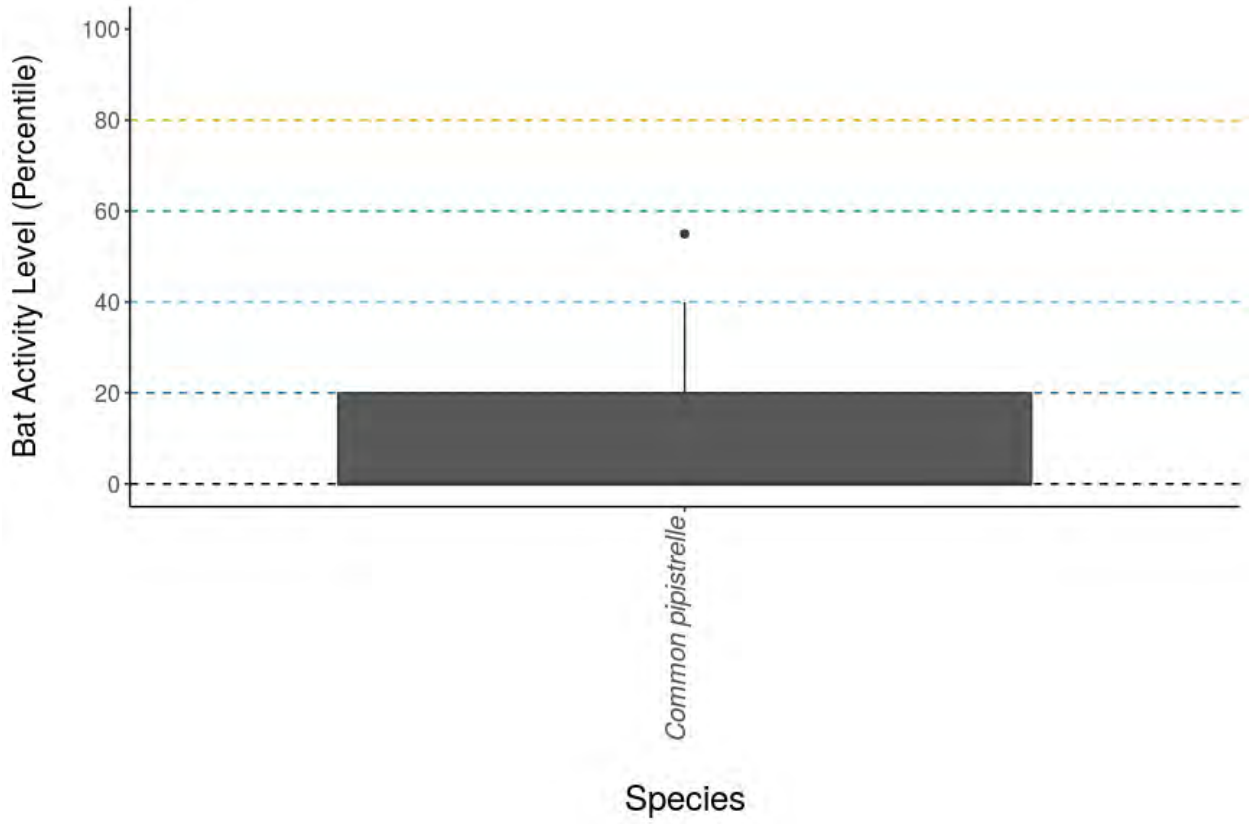
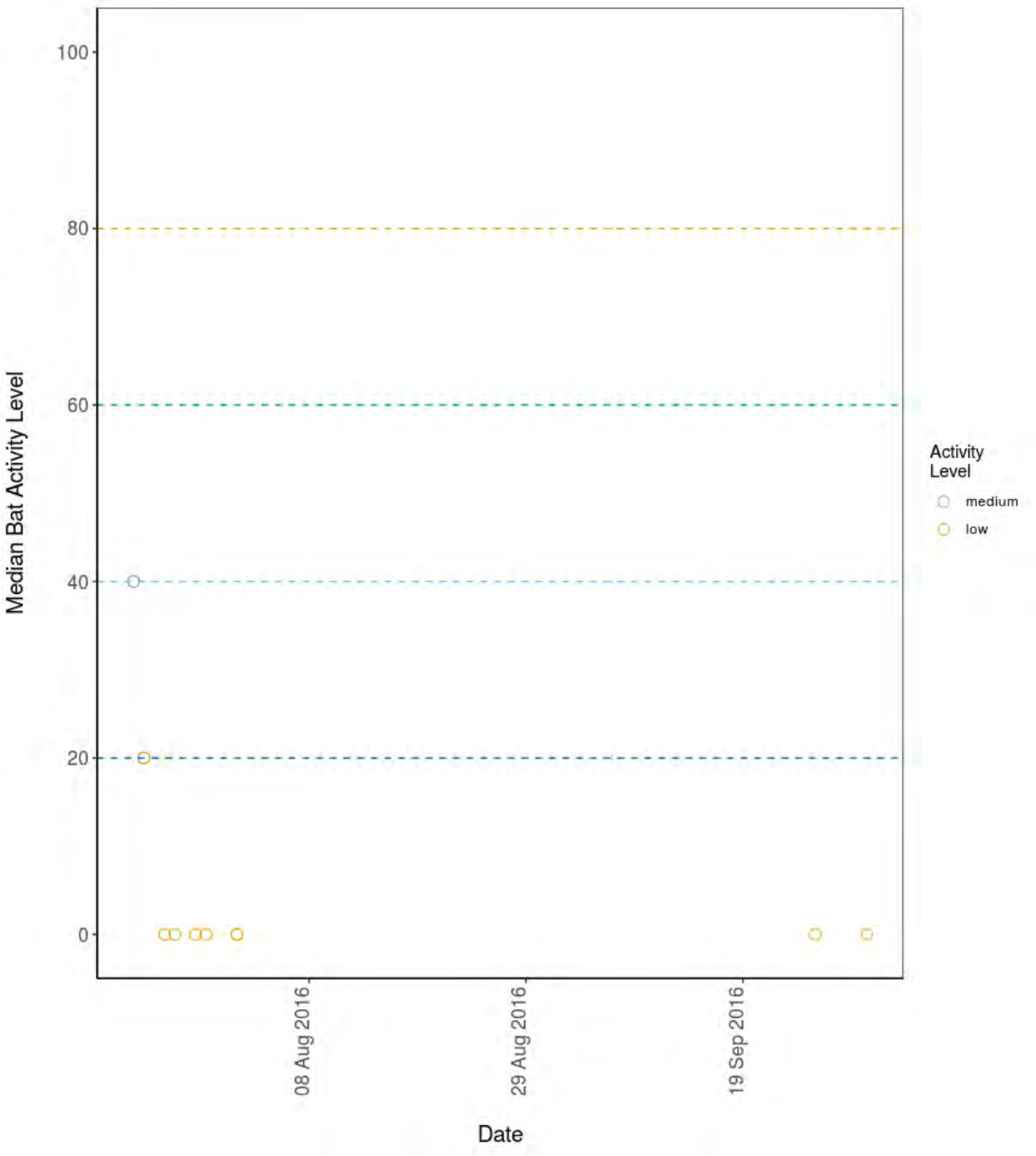


Figure 5. The median activity levels of bats recorded across all detectors each night.



3.5 PER SITE, PER MONTH

Table 9. Summary table showing the number of nights recorded bat activity fell into each activity band for each species during each month.

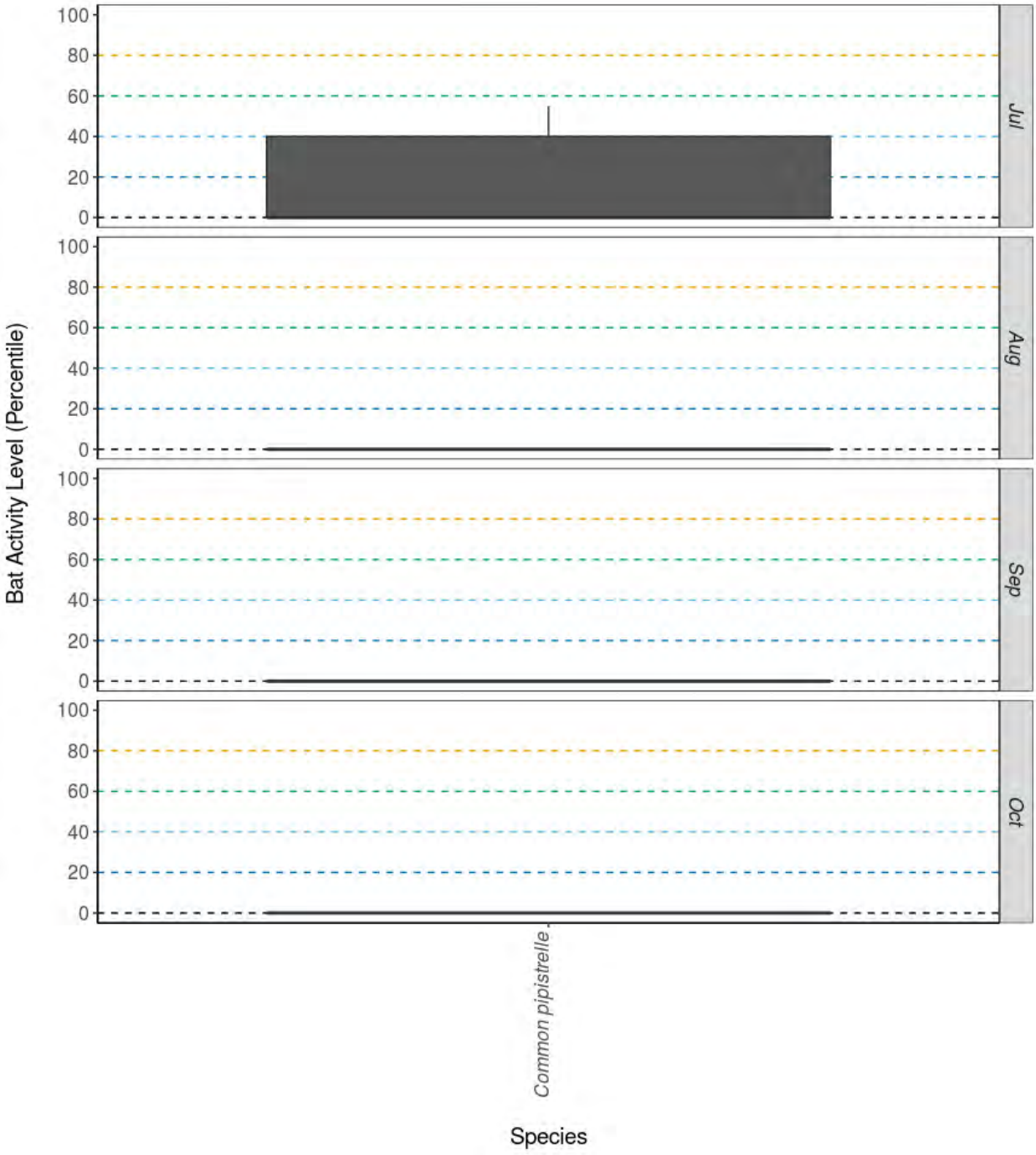
Species/Species Group	Month	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Pipistrellus pipistrellus	Jul	0	0	2	2	7
Pipistrellus pipistrellus	Aug	0	0	0	0	2
Pipistrellus pipistrellus	Sep	0	0	0	0	1
Pipistrellus pipistrellus	Oct	0	0	0	0	1

Table 10. Summary table showing key metrics for each species recorded per month.

Species/Species Group	Month	Median Percentile	95% CIs	Max Percentile	Nights Recorded
Pipistrellus pipistrellus	Jul	0	40 - 40	55	11
Pipistrellus pipistrellus	Aug	0	0 - 0	0	2
Pipistrellus pipistrellus	Sep	0	0 - 0	0	1
Pipistrellus pipistrellus	Oct	0	0 - 0	0	1

###Figures

Figure 6. The activity level (percentile) of bats recorded across each night of the bat survey for the entire site, split between months.


Bat Activity Level (Percentile)
100
80
60
40
20
0
Jul
Aug
Sep
Oct
Common pipistrelle
Species

3.6 PART 2: Nightly Analysis

4 ENTIRE SURVEY PERIOD

4.1 Sunrise and Sunset Times

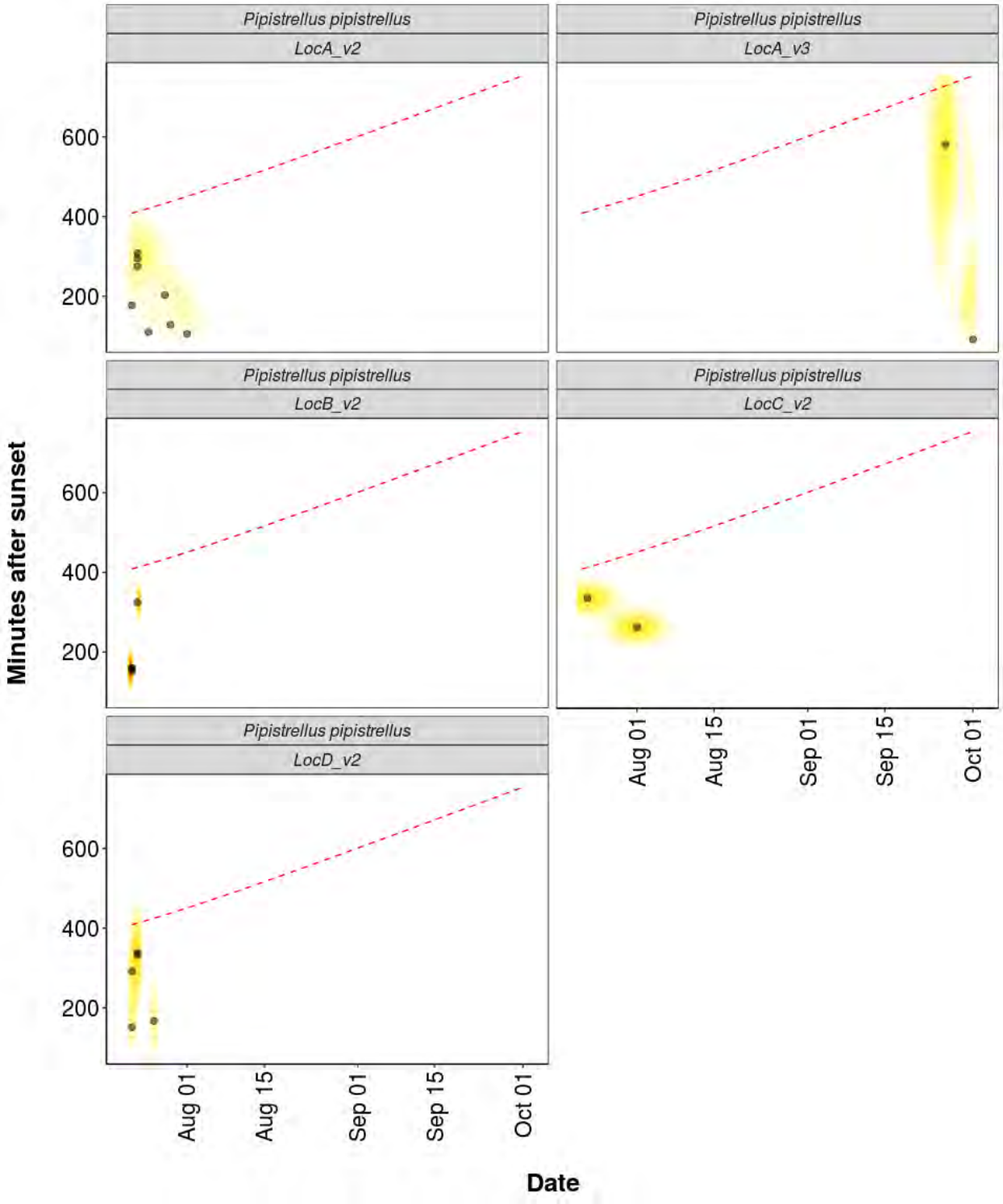
Table 11. The times of sunset and sunrise the following morning for surveys beginning on the date shown.

Night (y-m-d)	Sunset (hh:mm)	Sunrise (hh:mm)	Night Length (hours)
2016-07-22	21:58	04:47	6.8
2016-07-23	21:56	04:49	6.9
2016-07-25	21:52	04:53	7.0
2016-07-26	21:50	04:55	7.1
2016-07-28	21:46	04:59	7.2
2016-07-29	21:44	05:01	7.3
2016-08-01	21:37	05:08	7.5
2016-09-26	19:04	07:11	12.1
2016-10-01	18:49	07:23	12.6

5 DISTRIBUTION OF BAT ACTIVITY ACROSS THE NIGHT THROUGH TIME

5.1 Per Detector

Figure 7. Timing of bat calls plotted as minutes before/after sunset, whereby 0 on the y axis represents sunset. Sunrise throughout the survey period is depicted as the red dashed line. Colours indicate kernel densities, with darkest colours showing peaks of activity. These colours are comparative only within each plot, and do not account for overall activity.



6 ROOST EMERGENCE TIME AND BAT OBSERVATION

Based on: *Russ, Jon. 2012. British Bat Calls a Guide to species Identification. Pelagic Publishing.*

For more information see https://rbats-blog.updog.co/2018/05/29/bat-emergence/

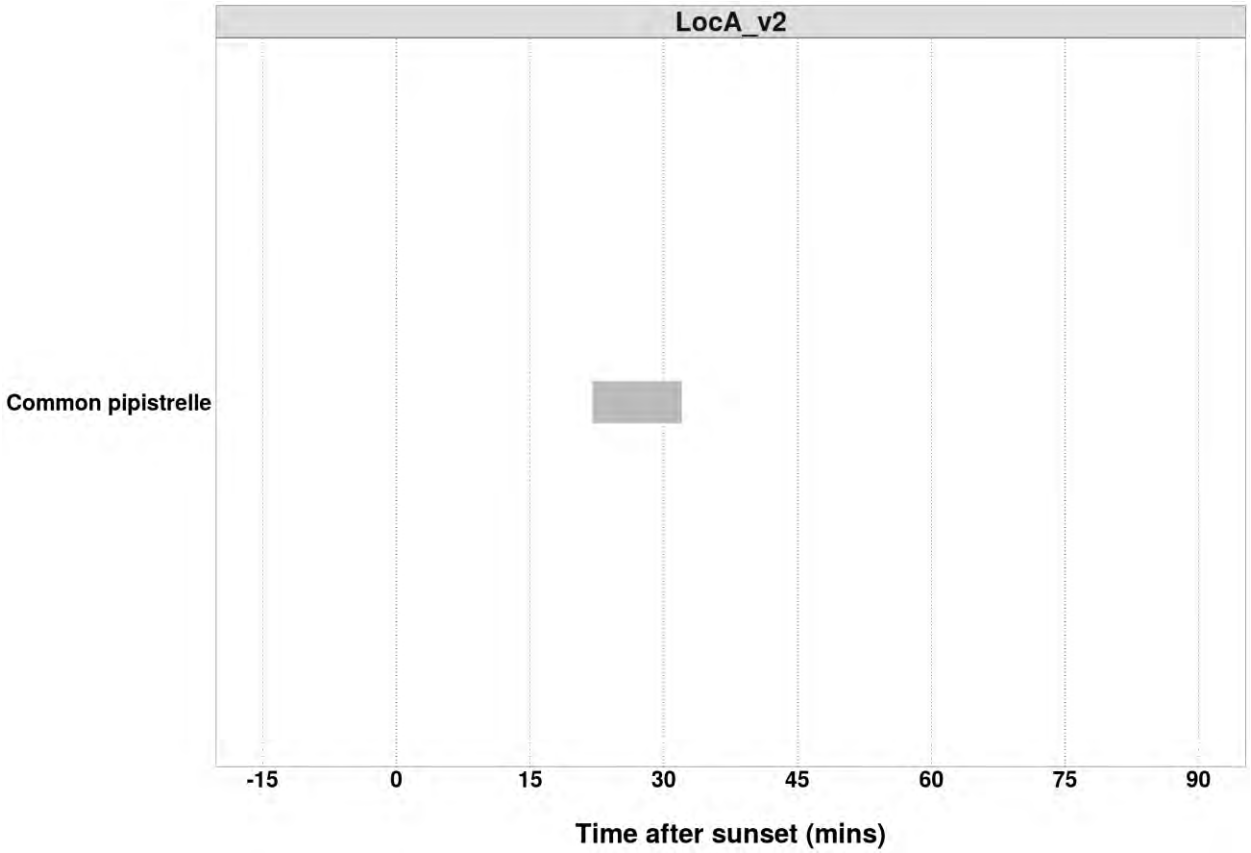
6.1 Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012) - Table

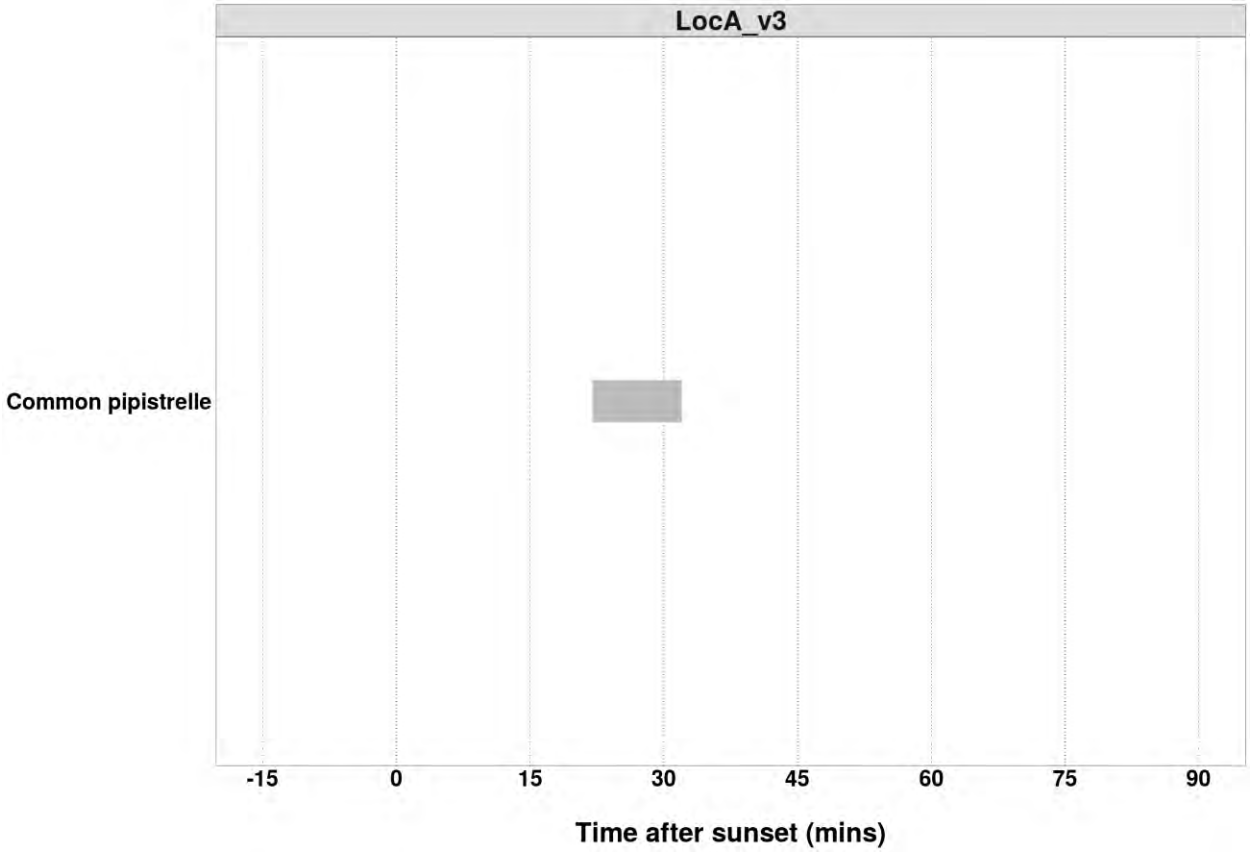
Table 12. Number of bat calls recorded before the upper time of the species-specific emergence time range, and which therefore may potentially indicate the presence of a nearby roost.

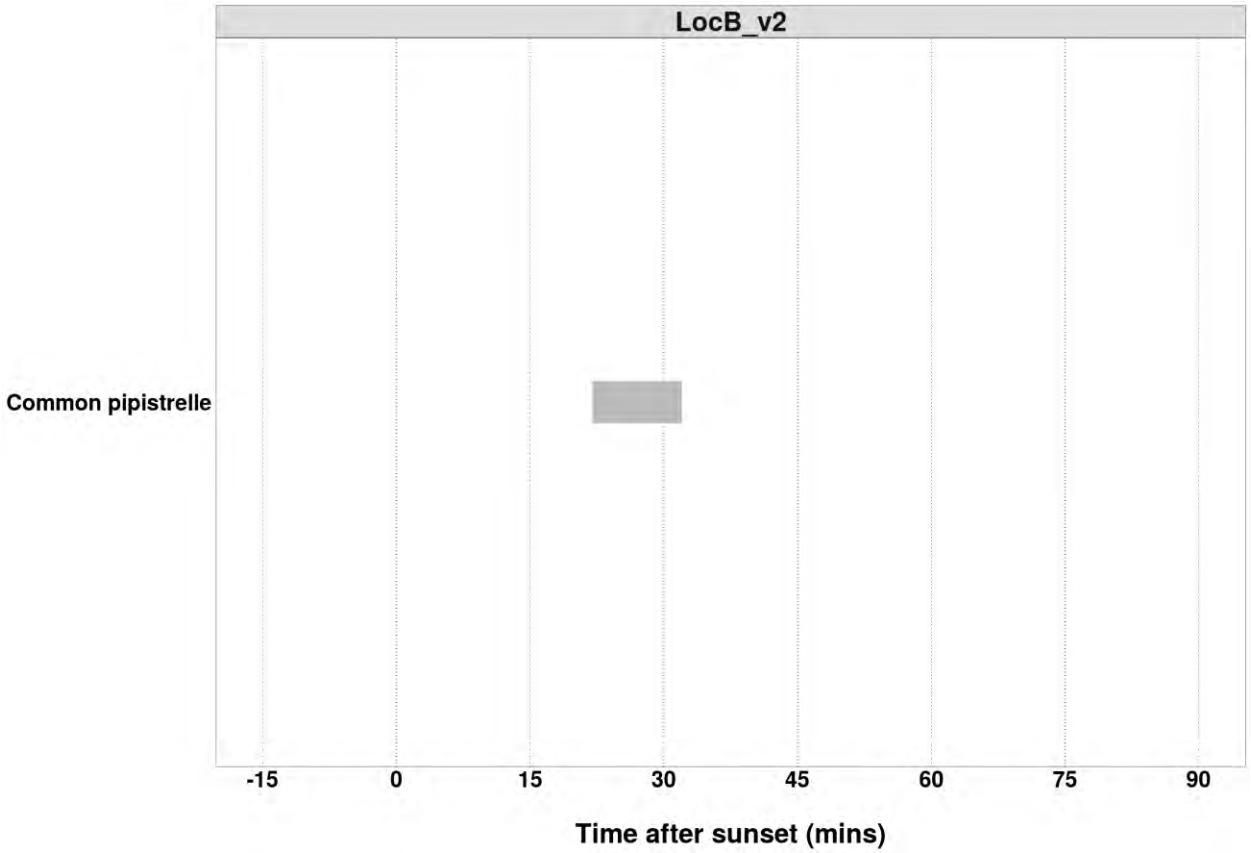
Species	Detector ID

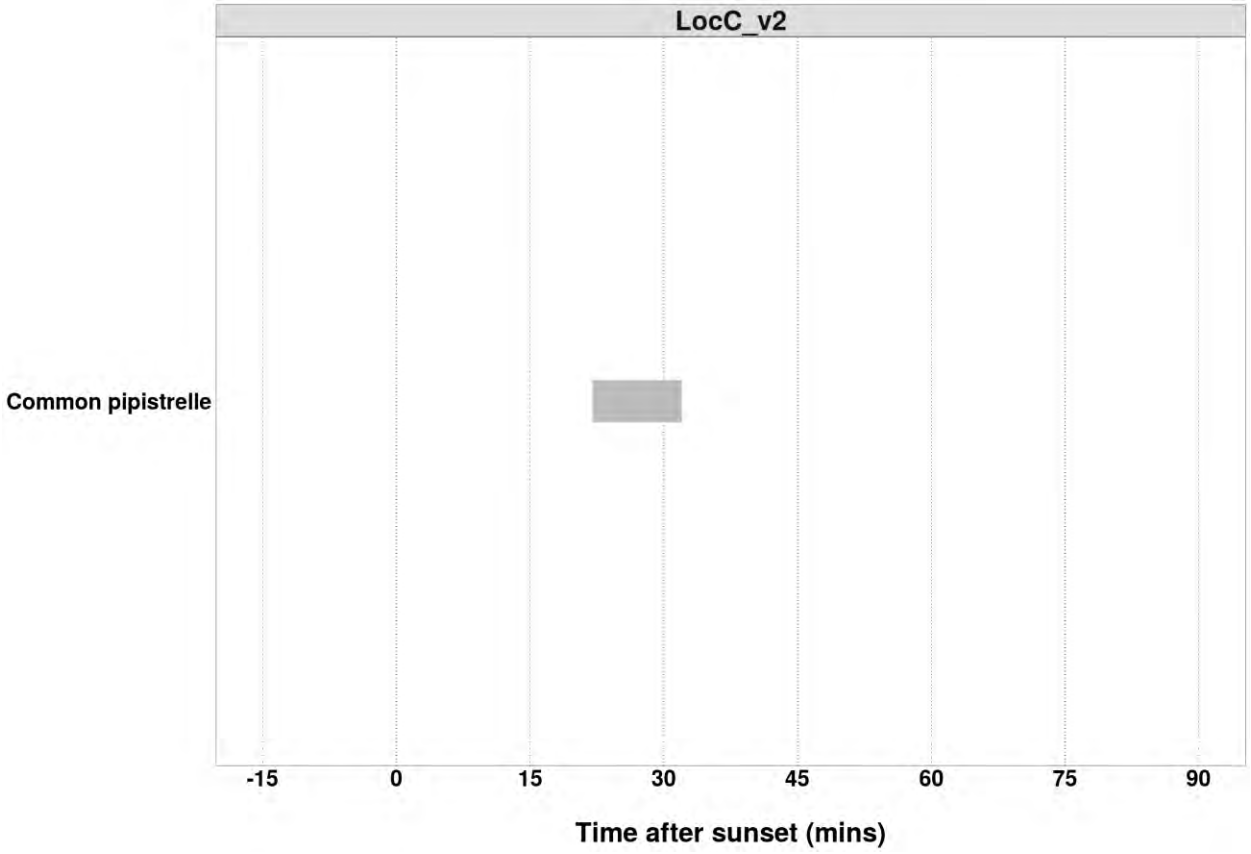
6.1.1 Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012) - Figures

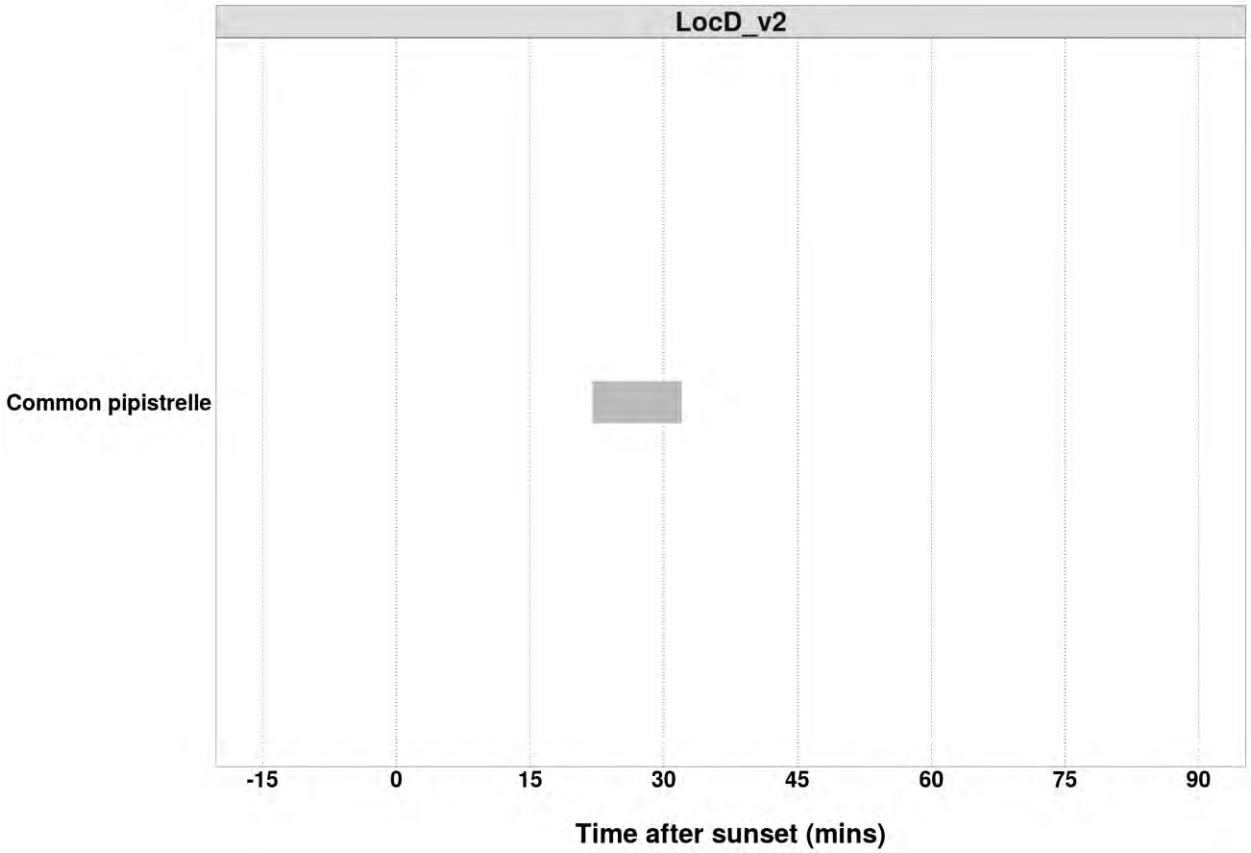
Figure 8. Time from 15 minutes before to 90 minutes after sunset. Species-specific emergence time ranges are shown as grey bars. Bat passes overlapping species-specific grey bars, or occuring earlier than this time range, may potentially indicate the presence of a nearby roost.


LocA_v2
Common pipistrelle
-15
0
15
30
45
60
75
90
Time after sunset (mins)


LocA_v3
Common pipistrelle
-15
0
15
30
45
60
75
90
Time after sunset (mins)


LocB_v2
Common pipistrelle
-15
0
15
30
45
60
75
90
Time after sunset (mins)


LocC_v2
Common pipistrelle
-15
0
15
30
45
60
75
90
Time after sunset (mins)



7 COUNTS OF BAT PASSES

7.1 All detectors

Table 14. The total number of passes recorded for each species across all of the detectors.
The 'Total' percentage may not be exactly 100% due to rounding of the percentages per species.

Species	Passes (No.)	Percentage of total (%)
Common pipistrelle	21	100
Total	21	100

8 COUNTS OF BAT PASSES

8.1 Per Detector

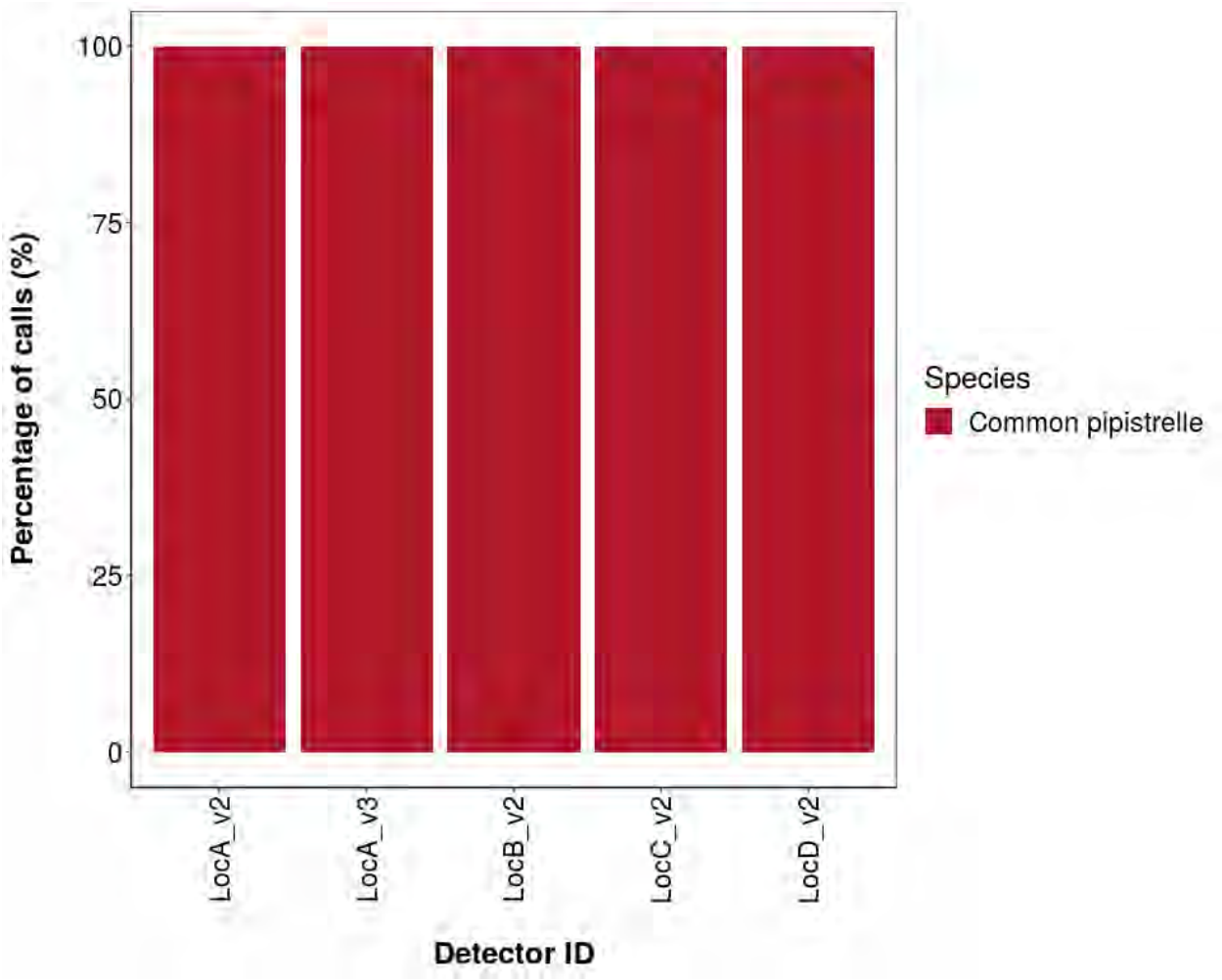
Table 15. The number of passes recorded for each species at each detector.

Species	Detector ID	Count (No)	Percentage by Detector (%)
Common pipistrelle	LocA_v2	8	100
Common pipistrelle	LocA_v3	2	100

Common pipistrelle	LocB_v2	4	100
Common pipistrelle	LocC_v2	2	100
Common pipistrelle	LocD_v2	5	100

9 SPECIES COMPOSITION

Figure 10. Percentage species composition of passes at each detector.



9.1 PART 2a: Presence Only

THE NEXT SECTION OF THE REPORT FEATURES THE RAW DATA SUPPLIED TO ECOBAT AND ONLY TAKES INTO ACCOUNT THE PRESENCE, AND NOT THE ABSENCE, OF EACH BAT SPECIES. FOR EACH NIGHT, THERE IS NO 'ZERO DATA' FOR WHEN SPECIES WERE NOT DETECTED.

9.2 Nightly Bat Pass Rate (Bat passes per hour)

10 MEDIAN PER DETECTOR

Table 16. The median Nightly Pass Rate (bat passes per hour, per night) of each species. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: *Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. Biodiversity and Conservation, 27(1), 265-267.* https://doi.org/10.1007/s10531-017-1418-5

Species	Detector ID	Median Pass Rate
Common pipistrelle	LocA_v2	0.1
Common pipistrelle	LocA_v3	0.1
Common pipistrelle	LocB_v2	0.3
Common pipistrelle	LocC_v2	0.1
Common pipistrelle	LocD_v2	0.3

10.1 Nightly Bat Pass Rate (Bat passes per hour)

11 MEAN PER DETECTOR

Table 17. The mean Nightly Pass Rate (bat passes per hour, per night) of each species at each detector. Values are given to 1 decimal place.

We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

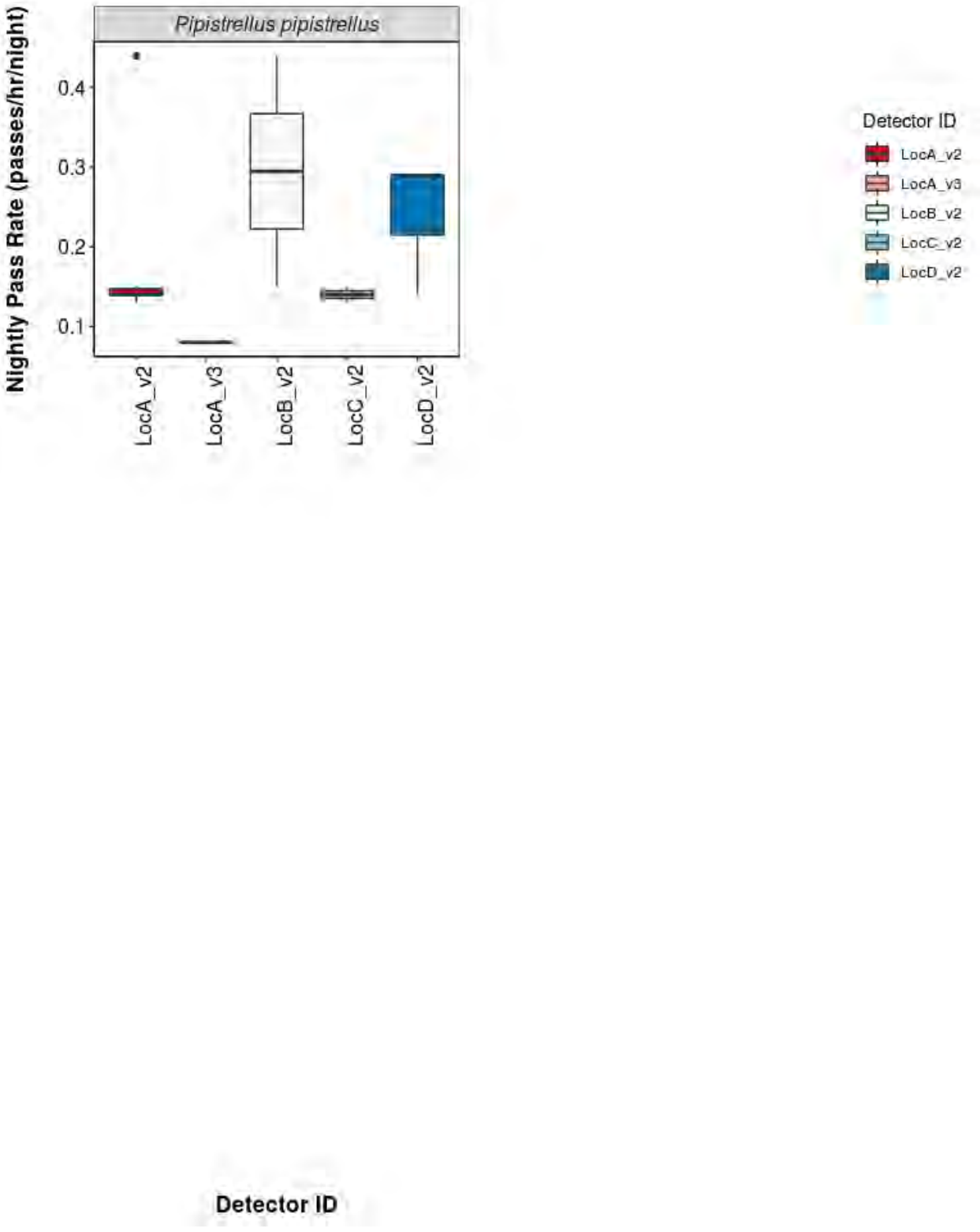
Species	Detector ID	Mean Pass Rate
Common pipistrelle	LocA_v2	0.2
Common pipistrelle	LocA_v3	0.1
Common pipistrelle	LocB_v2	0.3
Common pipistrelle	LocC_v2	0.1
Common pipistrelle	LocD_v2	0.2

12 NIGHTLY BAT PASSES (BAT PASSES PER HOUR)

12.1 Per Detector - Figures

Figure 11. Boxplots for the number of bat passes per hour each night, for each detector. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the

ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.


Pipistrellus pipistrellus
Nightly Pass Rate (passes/hr/night)
0.4
0.3
0.2
0.1
LocA_v2
LocA_v3
LocB_v2
LocC_v2
LocD_v2
Detector ID
LocA_v2
LocA_v3
LocB_v2
LocC_v2
LocD_v2
Detector ID

13 SPLIT BY MONTH

14 TOTAL BAT PASSES PER DETECTOR, EACH MONTH

14.1 Per Detector

Table 18. The total number of bat passes of each species in each month at each detector. This table simply tells you how many bats of each species were recorded passing each detector during each month. These numbers are not standardised by the night length, or how many nights each detector was active for during each month.

Species	Detector ID	Jul	Aug	Sep	Oct
Common pipistrelle	LocA_v2	7	1	0	0
Common pipistrelle	LocA_v3	0	0	1	1
Common pipistrelle	LocB_v2	4	0	0	0
Common pipistrelle	LocC_v2	1	1	0	0
Common pipistrelle	LocD_v2	5	0	0	0

15 SURVEY EFFORT

Table 19. The number of survey nights per month per detector.

Month	Detector ID	No. of Survey Nights
Jul	LocA_v2	5
Jul	LocB_v2	2
Jul	LocC_v2	1
Jul	LocD_v2	3
Aug	LocA_v2	1
Aug	LocC_v2	1
Sep	LocA_v3	1
Oct	LocA_v3	1

15.1 Nightly Bat Pass Rate for each Month

16 MEDIAN PER DETECTOR

Table 20. The median Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: *Lintott, P. R.,*

& Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. Biodiversity and Conservation, 27(1), 265-267. https://doi.org/10.1007/s10531-017-1418-5

Species	Detector ID	Jul	Aug	Sep	Oct
Common pipistrelle	LocA_v2	0.1	0.1	NA	NA
Common pipistrelle	LocA_v3	NA	NA	0.1	0.1
Common pipistrelle	LocB_v2	0.3	NA	NA	NA
Common pipistrelle	LocC_v2	0.2	0.1	NA	NA
Common pipistrelle	LocD_v2	0.3	NA	NA	NA

16.1 Nightly Bat Pass Rate for each Month

17 MEAN PER DETECTOR

Table 21: The mean Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. Values are given to 1 decimal place.

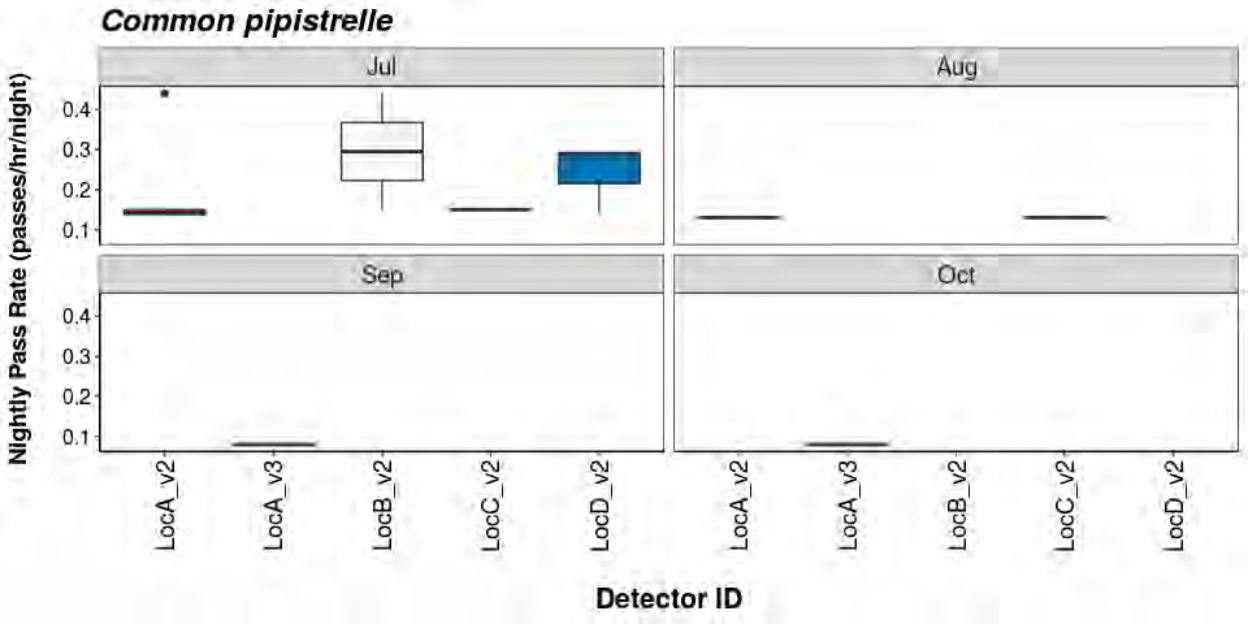
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Jul	Aug	Sep	Oct
Common pipistrelle	LocA_v2	0.2	0.1	NA	NA
Common pipistrelle	LocA_v3	NA	NA	0.1	0.1
Common pipistrelle	LocB_v2	0.3	NA	NA	NA
Common pipistrelle	LocC_v2	0.2	0.1	NA	NA
Common pipistrelle	LocD_v2	0.2	NA	NA	NA

17.1 Nightly Bat Pass Rate for each Month

17.2 Per Detector - Figures

Figure 12. Figures show boxplots for the number of bat passes per hour by detector, for each month. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.



18 BAT ACTIVITY PER DETECTOR LOCATION

Figure 13. Detector ID reference:

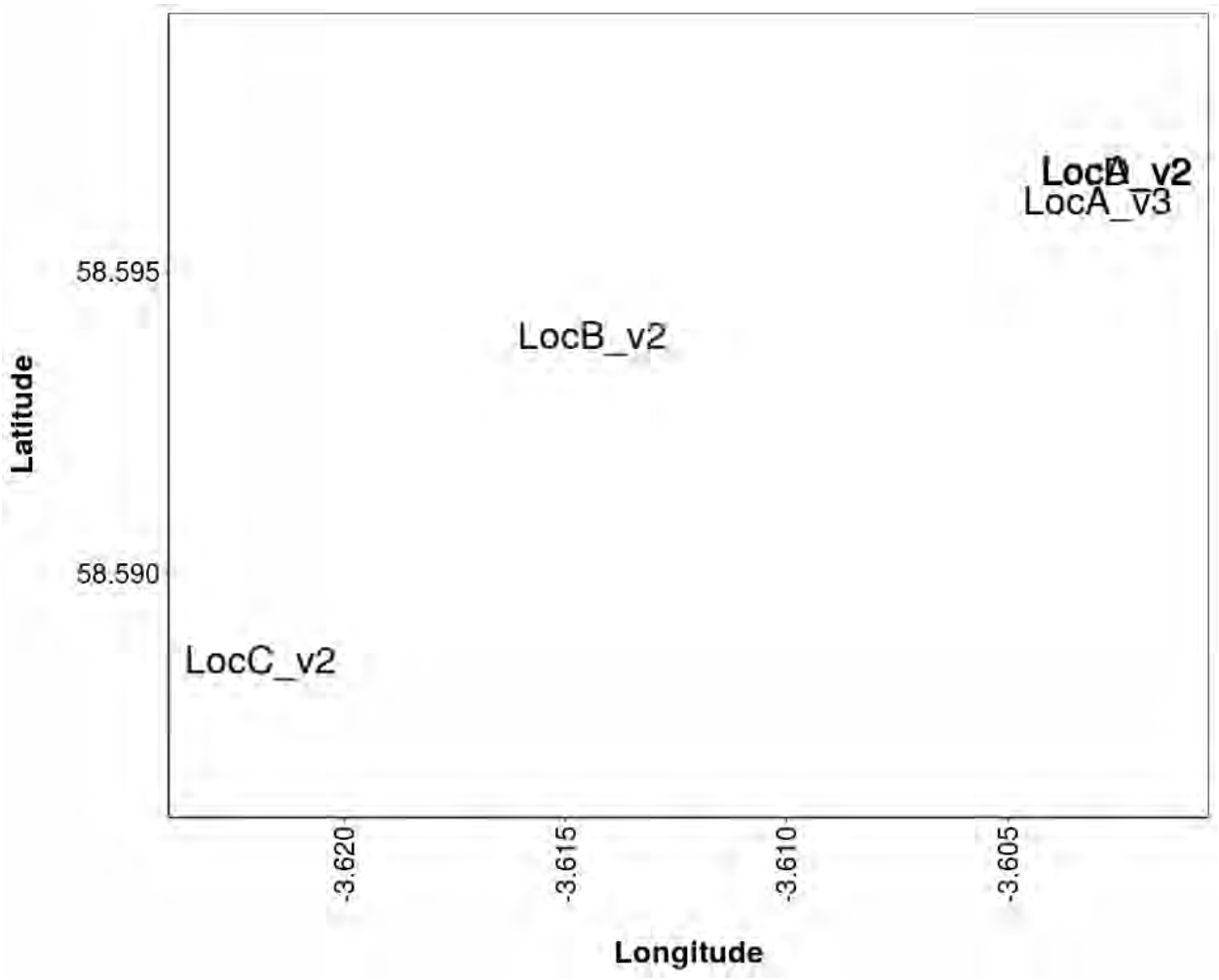


Figure 14. Median Nightly Pass Rate (bat passes/hr/night) throughout the survey period - represented by the size and colour of the point at each detector location.

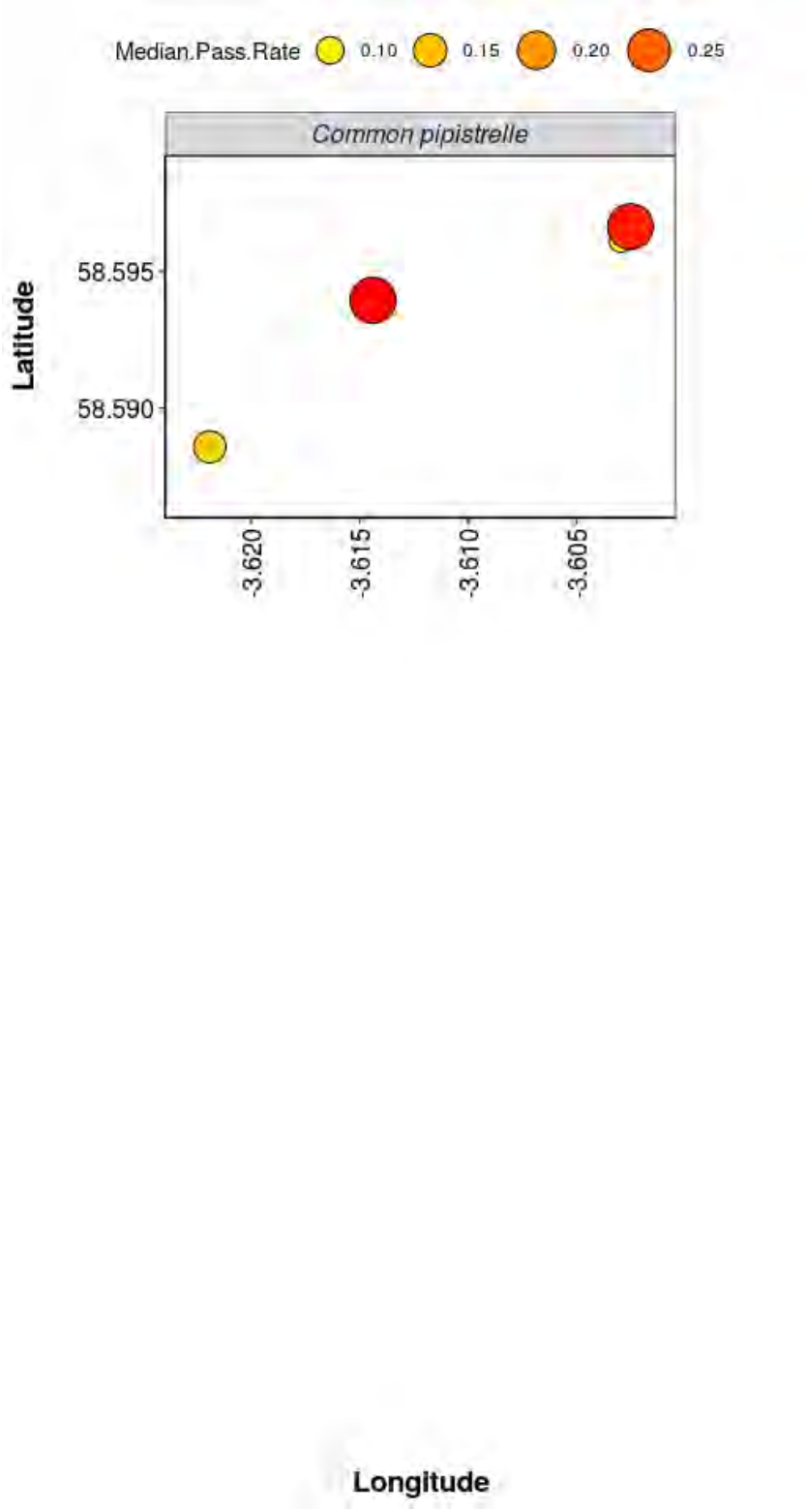
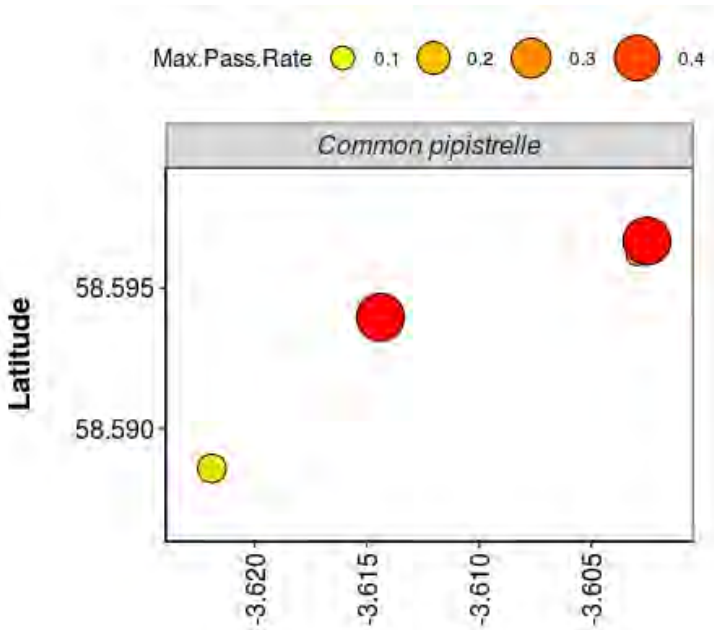


Figure 15. Maximum Nightly Pass Rate (bat passes/hr/night) recorded in a single night throughout the survey period - represented by the size and colour of the point at each detector location.


Max.Pass.Rate
0.1
0.2
0.3
0.4
Common pipistrelle
Latitude
58.595
58.590
-3.620
-3.615
-3.610
-3.605
Longitude

18.1 PART 2B: Includes absences

THE NEXT SECTION OF THE REPORT FEATURES THE DATA SUPPLIED TO ECOBAT BUT TAKES INTO ACCOUNT SPECIES ABSENCES, AND THEREFORE INCLUDES 'ZERO DATA' FOR WHEN SPECIES WERE NOT DETECTED AT EACH DETECTOR ON A NIGHT. THIS DRAMATICALLY LOWERS THE MEANS AND MEDIANS OF THE DATA PRESENTED.

18.2 Nightly Bat Pass Rate (Bat passes per hour)

19 MEDIAN PER DETECTOR

Table 22. The median Nightly Pass Rate (bat passes per hour, per night) of each species. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: *Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. Biodiversity and Conservation, 27(1), 265-267.* https://doi.org/10.1007/s10531-017-1418-5

Species	Detector ID	Median Pass Rate
Common pipistrelle	LocA_v2	0.1
Common pipistrelle	LocA_v3	0.1
Common pipistrelle	LocB_v2	0.3
Common pipistrelle	LocC_v2	0.1
Common pipistrelle	LocD_v2	0.3

19.1 Nightly Bat Pass Rate (Bat passes per hour)

20 MEAN PER DETECTOR

Table 23. The mean Nightly Pass Rate (bat passes per hour, per night) of each species at each detector. Values are given to 1 decimal place.

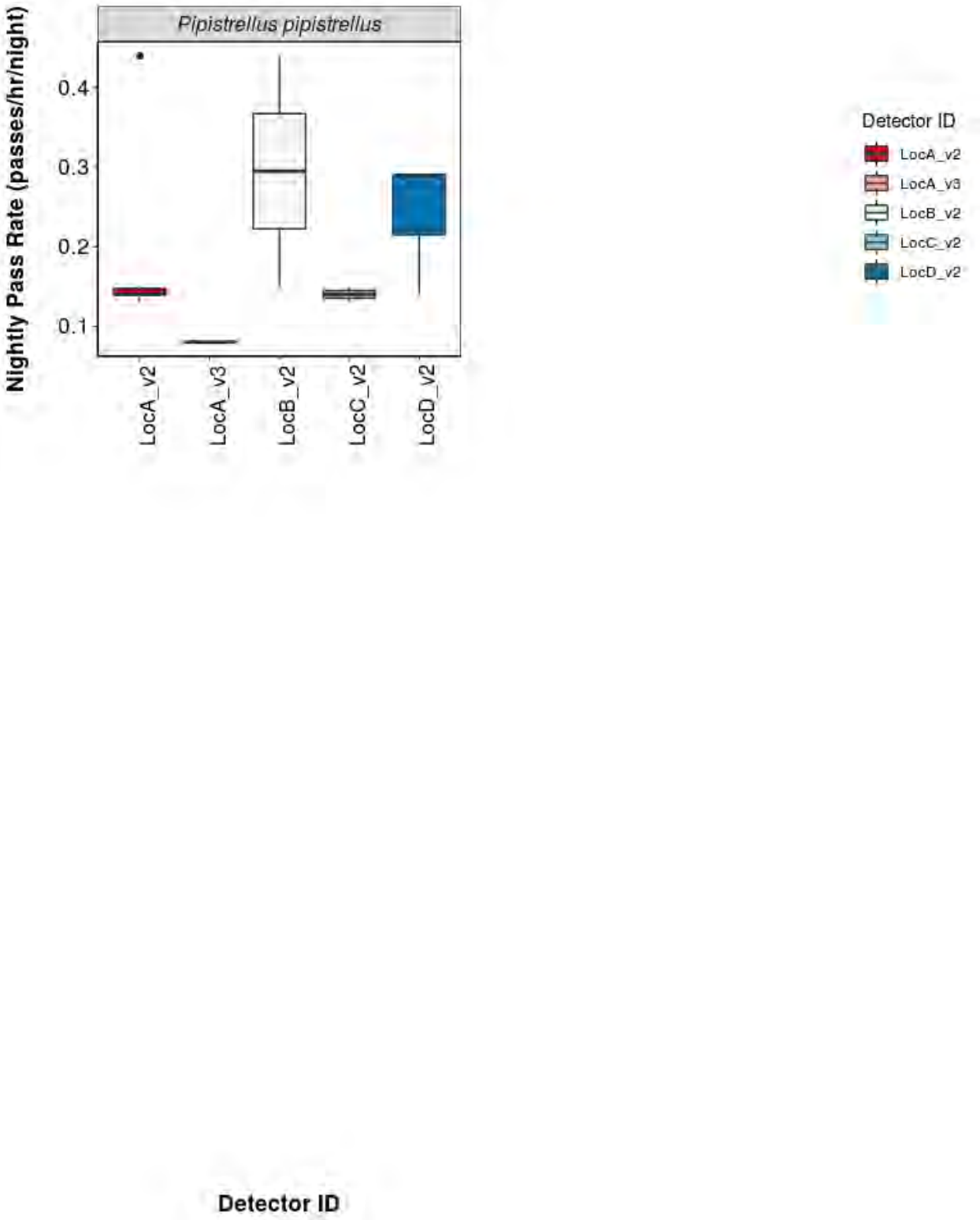
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Mean Pass Rate
Common pipistrelle	LocA_v2	0.2
Common pipistrelle	LocA_v3	0.1
Common pipistrelle	LocB_v2	0.3
Common pipistrelle	LocC_v2	0.1
Common pipistrelle	LocD_v2	0.2

21 NIGHTLY BAT PASSES (BAT PASSES PER HOUR)

21.1 Per Detector - Figures

Figure 16. Figures show boxplots for the number of bat passes per hour each night, for each detector. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.


Pipistrellus pipistrellus
Nightly Pass Rate (passes/hr/night)
0.4
0.3
0.2
0.1
LocA_v2
LocA_v3
LocB_v2
LocC_v2
LocD_v2
Detector ID
LocA_v2
LocA_v3
LocB_v2
LocC_v2
LocD_v2
Detector ID

22 SURVEY EFFORT

Table 24. The number of nights bats were detected per month per detector.

Month	Detector ID	No of Survey Nights
Jul	LocA_v2	5
Jul	LocB_v2	2
Jul	LocC_v2	1
Jul	LocD_v2	3
Aug	LocA_v2	1
Aug	LocC_v2	1
Sep	LocA_v3	1
Oct	LocA_v3	1

22.1 Nightly Bat Pass Rate for each Month

23 MEDIAN PER DETECTOR

Table 25. The median Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: *Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. Biodiversity and Conservation, 27(1), 265-267.* https://doi.org/10.1007/s10531-017-1418-5

Species	Detector ID	Aug	Jul	Oct	Sep
Common pipistrelle	LocA_v2	0.1	0.1	NA	NA
Common pipistrelle	LocA_v3	NA	NA	0.1	0.1
Common pipistrelle	LocB_v2	NA	0.3	NA	NA
Common pipistrelle	LocC_v2	0.1	0.2	NA	NA
Common pipistrelle	LocD_v2	NA	0.3	NA	NA

23.1 Nightly Bat Pass Rate for each Month

24 MEAN PER DETECTOR

Table 26. The mean Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. Values are given to 1 decimal place.

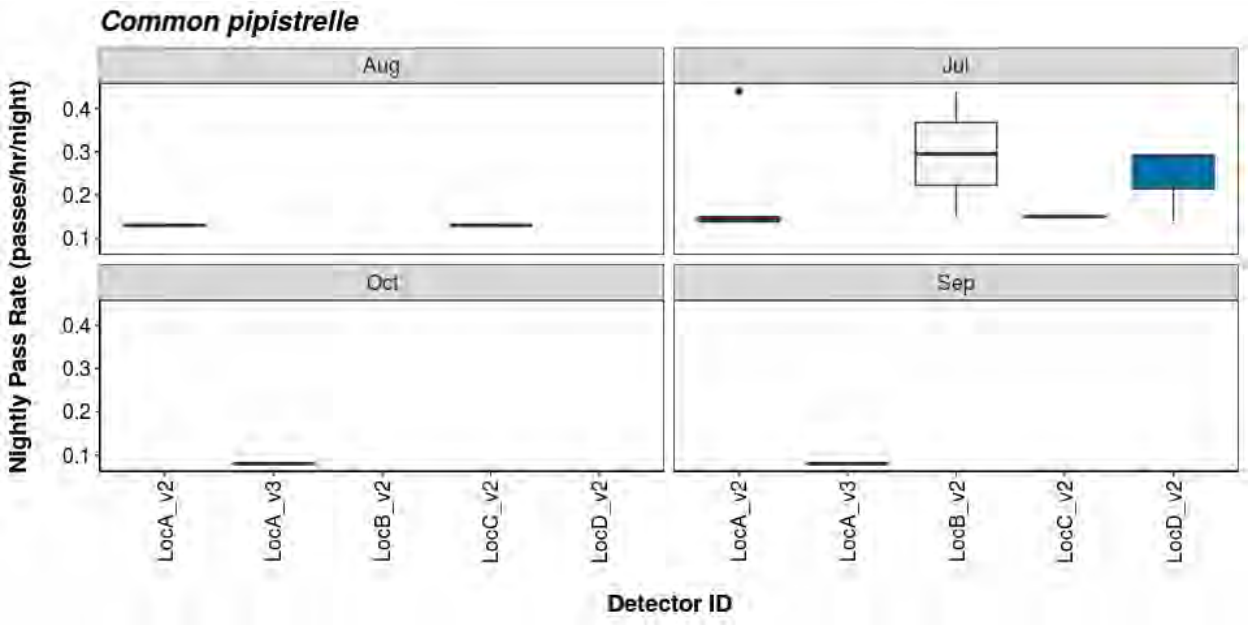
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Aug	Jul	Oct	Sep
Common pipistrelle	LocA_v2	0.1	0.2	NA	NA
Common pipistrelle	LocA_v3	NA	NA	0.1	0.1
Common pipistrelle	LocB_v2	NA	0.3	NA	NA
Common pipistrelle	LocC_v2	0.1	0.2	NA	NA
Common pipistrelle	LocD_v2	NA	0.2	NA	NA

24.1 Nightly Bat Pass Rate for each Month

24.2 Per Detector - Figures

Figure 17. Figures show boxplots for the number of bat passes per hour by detector, for each month. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.



25 BAT ACTIVITY PER DETECTOR LOCATION

Figure 18. Detector ID reference:

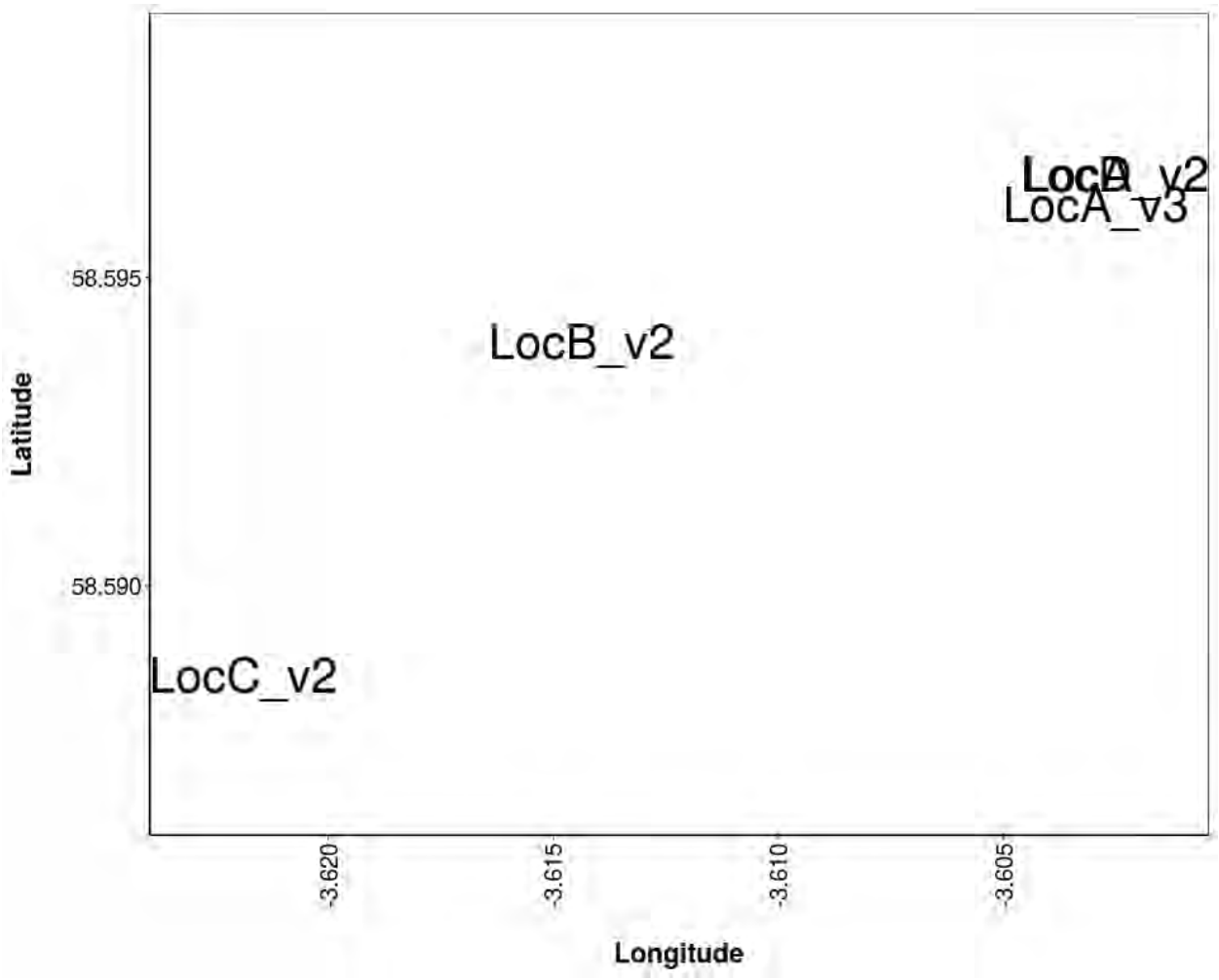


Figure 19. Median Nightly Pass Rate (bat passes/hr/night) throughout the survey period - represented by the size and colour of the point at each detector location.

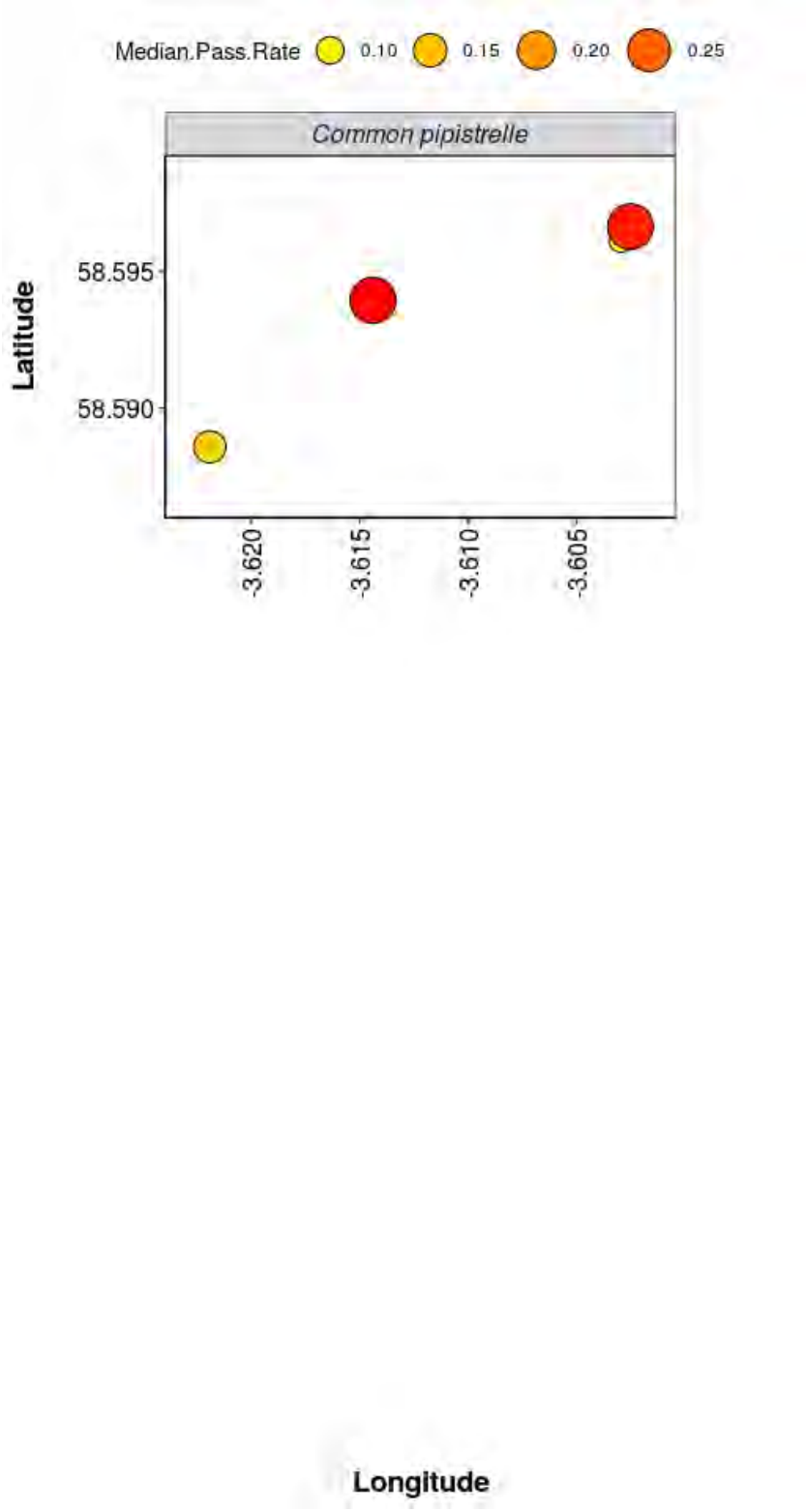
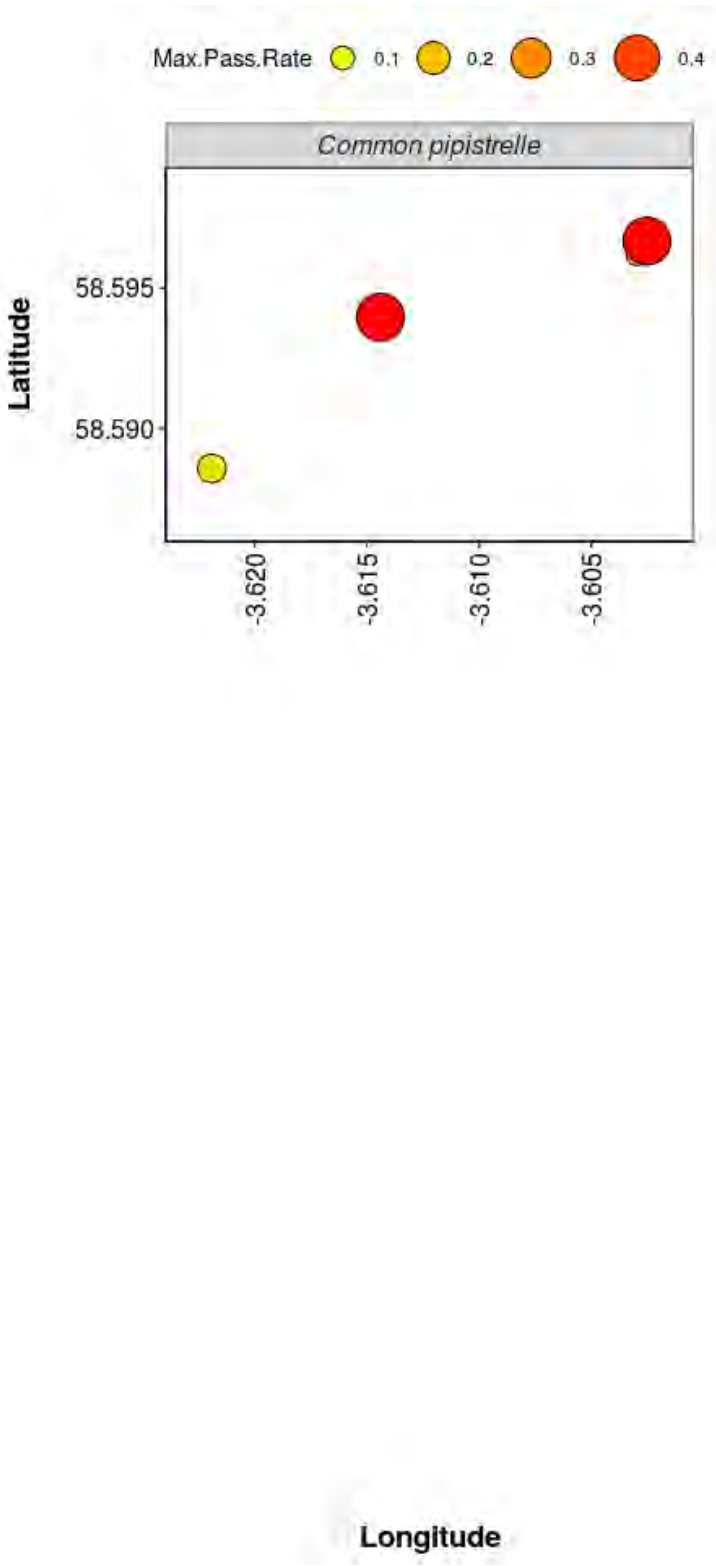


Figure 20. Maximum Nightly Pass Rate (bat passes/hr/night) recorded in a single night throughout the survey period - represented by the size and colour of the point at each detector location.



Thank you for using Ecobat! If you have any questions please email info@themammalsociety.org.uk

Cairnmore Hill Wind Farm

Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm

Technical Appendix 7.4

This Report was prepared by Caledonian Conservation Ltd in 2014 for the Hill of Forss Wind Farm (see Chapter 3: Site Selection, Design Evolution and Alternatives), and details the baseline conditions of non-avian ecology from surveys undertaken in 2014. It should be noted that any references to distances from infrastructure within this report are no longer valid as the layout of the Proposed Development has changed. References to Technical Appendices 5.1, 5.2 and 5.3 refer to a previous naming convention; Technical Appendices 7.1, 7.2 and 7.3 now replace these. The report should be read in conjunction with Technical Appendices 7.1, 7.2, and 7.3, to provide the context under which the updated ecology surveys and corresponding reports have been completed by MacArthur Green.

Prepared by:	Caledonian Conservation Ltd
Date:	22nd December 2014

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22nd December 2014 Ref: CC0111/R4 Caledonian Conservation Ltd

Summary

Caledonian Conservation Ltd was commissioned by RES UK & Ireland Ltd (RES) to complete baseline ecology surveys for the proposed Hill of Forss Wind Farm site in Caithness.

The proposed Hill of Forss Wind Farm site is located approximately 6km west of Thurso and is currently used for rough grazing.

Surveys included an Extended Phase 1 Habitat Survey for habitats and protected mammals, a bat survey and a National Vegetation Classification (NVC) survey.

The site is located some distance from any designated sites, and few sensitivities were identified during baseline surveys.

The Phase 1 Habitat survey identified that the site may support Groundwater Dependent Terrestrial Ecosystems (GWDTEs) and may also support Annex I habitats. No signs of protected mammals were found during the targeted surveys and furthermore habitat likely to support protected mammals was not found onsite during the survey. Therefore it is unlikely that the proposed development will impact on protected mammal populations.

An NVC survey was completed to assess the impact of development on potential GWDTEs and Annex I habitats. The NVC survey showed that the site is roughly divided between the higher ground of heathland, predominately wet heath, and grassland which covers the ground in and around the enclosed fields at the north of the site. The heathland present onsite is listed as an internationally important habitat under Annex I of the Habitats Directive. Highly Groundwater Dependent Terrestrial Ecosystems were not found onsite although wet heath is considered Moderately Groundwater Dependant (SEPA 2012). The habitats onsite are of poor quality due to grazing, trampling and other human activity. An appropriate Habitat Management and Monitoring Plan (HMMP) including a grazing regime and a control on burning would help to mitigate for the loss of habitat and benefit local biodiversity. Small areas onsite also contain Annex I listed swamp and blanket bog communities, the very limited area of these habitats means that negative impacts can be avoided by micro-siting tracks and other structures away from these features.

Habitat onsite is unsuitable to support otter, water vole, badger or pine marten and no field signs of these species were found. However, it is possible that otter or pine marten could pass through the site due to their large territorial ranges in areas of sub-optimal habitat. Therefore pre-construction surveys and the covering of or provision of ramps within excavations or trenches are recommended as mitigation for these species.

Four of the five bat species found in Caithness were recorded during the survey, all of which are considered to be at low (Natterer's bat and Daubenton's bat) or medium risk (soprano and common pipistrelle) of collision with wind turbines. In addition an extremely low number of bat passes were recorded for all species therefore it is unlikely that the proposed wind farm at Hill of Forss will have an impact on local bat populations.

Local bat populations are unlikely to be affected by the wind farm, however, it is recommended that wind turbines are excluded from a buffer of 50m around high potential bat roost habitats, high value foraging areas and potential commuting routes in order to minimise risk of bat collisions.

It should be noted that the results of ornithological surveys are contained in a separate report.

1 Introduction

Caledonian Conservation Ltd was commissioned by RES UK & Ireland Ltd (RES) to complete baseline ecology surveys for the proposed Hill of Forss Wind Farm site in Caithness.

An Extended Phase 1 Habitat Survey and National Vegetation Classification (NVC) survey were undertaken in July and August of 2014 and bat surveys were undertaken between May and September 2014.

This report presents the results of this work.

Ecology fieldwork was completed by Eamonn Flood (Senior Ecologist), Glenn Norris (Ecologist), Steven Johnston (Ecologist) and Stuart Spray (Associate Ecologist).

This report was prepared by Eamonn Flood, Chris Cathrine (Director), Glenn Norris, Steven Johnston and Stuart Spray. Mapping was undertaken using ArcGIS 10, and completed by Chris Cathrine, Glenn Norris and Steven Johnston.

2 The Proposed Development

The proposed Hill of Forss Wind Farm site is located approximately 6km west of Thurso. The site is currently used for rough grazing. The site location is shown in Figure 1 and site boundary is shown in Figure 2.

The proposed wind farm infrastructure will include:

- Wind turbines and turbine foundations;
- Access tracks;
- Control Building;
- Meteorological Mast; and
- Grid Connection (transformers, cables and substation).

3 Methodology

An Extended Phase 1 Habitat Survey and NVC survey were completed in July and August 2014 and a bat survey was undertaken from May to September 2014.

3.1 Desk-based Study and Consultation

A brief preliminary desk study was undertaken using the National Biodiversity Network (NBN) gateway to inform surveys for protected species on the site based on known distribution in the wider area. Note that these results cannot be used in support of a planning application – a full desk study requiring purchase of data from data providers would be required to inform the Ecological Impact Assessment.

In addition, a detailed consultation document was issued to SNH, who were invited to comment on work completed to date (April 2014) and the proposed approach to progress the site.

3.2 Extended Phase 1 Habitat Survey

An Extended Phase 1 Habitat Survey was conducted within the proposed site boundary (Figure 2) during July 2014. This survey involved searching for signs of protected species (particularly mammals) and mapping the habitats in this area to a Phase 1 level.

The protected species survey targeted otter, water vole, badger and pine marten. All signs and sightings were recorded on large scale maps, and locations marked using hand held GPS devices.

Full details for survey visits (including weather conditions and observers) are included in Table A1.1 (Appendix 1).

3.2.1 Phase 1 Habitat Mapping

Standard Phase 1 Habitat Mapping methodology was used to identify habitat areas of ecological importance, as outlined in the Handbook for Phase 1 Habitat Survey published by the Joint Nature Conservancy Council (JNCC) (2007). All Groundwater Dependent Terrestrial Ecosystem (GWDTE) habitats and potential Annex I habitats were also surveyed to NVC level in accordance with guidance (Scottish Environmental Protection Agency [SEPA] 2012) (Section 3.3). Target notes were made during the Phase 1 Habitat Survey regarding habitat features of note.

3.2.2 Protected Species Survey

A protected species survey was undertaken onsite and within 500m beyond the site boundary. This survey targeted otter (*Lutra lutra*), water vole (*Arvicola amphibius*), badger (*Meles meles*) and pine marten (*Martes martes*). All signs and sightings were recorded on large scale maps, and locations marked using hand held GPS devices.

Suitable habitat was also noted for bats, amphibians and reptiles in order to identify the need for further targeted survey work to inform an ecological assessment, which can be used to support a planning application.

Target notes were made during the Phase 1 survey regarding field signs and habitat features of note.

3.2.2.1 Otter

A full otter survey was conducted following standard methodology and using an appropriate field guide (Bang and Dahlstrøm 2006; Chanin 2003a; Chanin 2003b). Field signs included:

- Holts – below ground resting places;
- Couches – above ground resting places;
- Prints; and
- Spraints – faeces used as territorial markers, with a characteristic sweet odour.

3.2.2.2 Water Vole

Areas of potentially suitable habitat were surveyed following standard methodology and using an appropriate field guide (Bang and Dahlstrøm 2006; Harris *et al.* 2009; Strachan *et al.* 2011). This involved recording the following field signs:

- Faeces – recognisable by their size, shape, and content, and also distinguishable from rat droppings by their smell, if not desiccated;
- Latrines – faeces are often deposited at discrete locations known as latrines;
- Feeding stations – food items are often brought to feeding stations along pathways and haul out platforms, indicated by neat piles of chewed vegetation up to 10cm long;
- Burrows – appear as a series of holes along the water's edge distinguishable from rat burrows by size and position;
- Lawns – may appear as grazed areas around burrows;
- Nests – where the water table is high, above ground woven nests may be found;
- Footprints – tracks may occur at the water's edge leading into vegetation cover, and may be distinguishable from rat footprints by size; and
- Runways – low tunnels pushed through vegetation near the water's edge, which are less obvious than rat runs.

3.2.2.3 Badger

All ground within the survey area was searched for field signs of badger, following standard methodology and using appropriate field reference guides and Scottish Natural Heritage (SNH) guidance (Roper 2010; Bang and Dahlstrøm 2006; SNH 2001). Badger field signs include:

- Setts – burrows indicating badger setts (level of activity and other signs may allow determination of sett type, *i.e.* main sett, annexe sett, subsidiary sett or outlying sett);
- Prints;
- Latrines (dung pits used as territorial markers);
- Hairs – highly distinctive, and often become snagged on fences;
- Feeding signs – snuffle holes (small scrapes where badgers have searched for earthworms, insects or tubers); and
- Paths.

3.2.2.4 Pine marten

Areas of potentially suitable habitat were surveyed following standard methodology and using an appropriate field guide (Bang and Dahlstrøm 2006). This involved recording the following field signs:

- Faeces – recognisable by their size, shape, and content, and also distinguishable from fox droppings by their smell, if not desiccated;
- Dens – usually in hollows in trees, but also subterranean dens amongst tree roots, should no suitable tree dens be found; and,
- Footprints – may be found on softer ground and can be differentiated from fox and other mustelids by size and shape.

3.3 National Vegetation Classification Survey

An NVC survey was considered necessary due to the potential of the site to support GWDTEs and Annex I habitats as identified by the Phase 1 Habitat Survey. A full NVC survey was completed in the proposed site boundary (Figure 2) in order to identify any areas of good quality peatland habitat which may be included under Annex I of the Habitats Directive. This survey also ensured that any potential GWDTEs were identified in accordance with guidance (SEPA 2012; UK Technical Advisory Group on the Water Framework Directive [UKTAG] 2003; UKTAG 2009). The NVC survey was completed following the methods described in Rodwell (2006). Communities were compared with the published descriptions given in Rodwell *et seq*. (1991) and in Averis *et al*. (2004). The survey was carried out in July and August of 2014. Full details for survey visits (including weather conditions and observers) are included in Table A1.1 (Appendix 1).

Aerial photos were reviewed to give an overview of the site and to identify broad distributions of vegetation types and an initial site walkover was undertaken, noting the main NVC communities present. Quadrat data was then collected for comparison with published species accounts. The DAFOR dominance scale was used where the collection of quadrat data was impractical (e.g. in ponds) or the habitat fragmented or uniform (e.g. gorse patches) to record vegetation in accordance with guidance (Rodwell 2006).

The NVC communities identified were then mapped and community accounts provided, making particular reference to communities of conservation concern.

Results from the NVC survey were then used for identifying GWDTEs using the relevant guidance (SEPA 2012; UK Technical Advisory Group on the Water Framework Directive [UKTAG] 2003; UKTAG 2009). The process of identifying wetlands was also informed by the methodology published in SNIFFER (2009). Target notes were made during the NVC survey regarding habitat features of note.

3.4 Bats

3.4.1 Methodology Rationale

The aim of the survey was to assess the level of use of the site by foraging, commuting and roosting bats using activity transect and static sampling methods.

In addition, habitat within the boundary of the site was assessed for suitability for foraging, commuting and roosting bats.

Surveys followed appropriate guidance and best practice (Natural England 2014; Bat Conservation Trust [BCT] 2007; BCT 2011; Hundt 2012; Cathrine and Spray 2009).

Bat field surveys were undertaken using two main methods:

- The landscape was assessed for its potential value to roosting, foraging and commuting bats; and
- Bat activity was evaluated by conducting bat activity line transects at dusk and dawn, and point activity surveys using remote bat detectors.

All of the bat survey work was conducted by Associate Ecologist Stuart Spray, a licensed bat ecologist with 20 years of experience surveying for bats in the UK and abroad.

3.4.2 Walkover Survey

An initial walkover survey was carried out in May 2014 to provide preliminary data on habitat and buildings which appeared to be of potential value to bats. These allowed the identification and prioritisation of areas requiring surveys and potential survey effort required for the summer survey season.

3.4.3 Bat Habitat Assessment Survey

It has been well documented that individual bats and colonies often use multiple tree roosts during the summer months and can move from one roost to another on a daily basis. As a result, techniques such as bat detector surveys cannot be relied upon to identify all tree roosts in favourable habitat (such as mature broad-leaved woodland or mature scattered broad-leaved trees). It has been shown that the only reliable method of locating bats roosting in such situations is to catch and radio track them back to their roosts over a period of weeks or to climb and visually inspect each tree.

As a result, rather than relying on identifying individual tree roosts, a habitat map was prepared with all high potential roosting, commuting and foraging habitat within the survey area clearly identified (Figure 3). This was completed with a view to establishing 50m buffer zones to avoid disturbance and mortality in accordance with current guidance (Natural England 2014).

The habitat map was prepared using a combination of visual and walkover surveys conducted during daylight hours using 1:10,000 Ordnance Survey maps and aerial photography. All habitats such as woodland, coniferous forest, watercourses, water bodies, rough grassland, scrub margins, linear features (walls and hedgerows) and man-made structures were mapped and assessed for their potential value to foraging, commuting and roosting bats (Walsh and Harris 1996a, 1996b; Jenkins *et al*.1998).

All criteria for assessing bat habitat is shown in Table 1.

Table 1. Criteria for assessing roosting, foraging and commuting habitat.

Bat Habitat Value	Roosting	Foraging	Commuting
High	Woodlands: High proportion of trees with roost potential (suitable roost sites and access points in cracks, crevices and other gaps) - > 1 tree in 50 with potential. Diverse choice of different roosts. Caves/tunnels/mines/ice houses with humid atmosphere and sheltered, stable temperature conditions. Low disturbance levels.	High insect abundance. Native woodland/trees/hedgerows offering shelter and diverse edge habitat, and open parkland, suitable for Leisler's bats. Slow flowing/still freshwater features with sheltered vegetated edges. Low disturbance levels from lighting, pollutants, human activity.	Continuous, unbroken linear feature providing shelter and/or foraging opportunities and connectivity with other landscape features including roost and foraging areas. Includes tree lines, woodland edges, hedgerows, waterways, walls, woodland tracks, road and drainage networks, buildings.
Medium	Roost sites and access points in cracks, crevices and gaps present but not ideal due to size. Moderate disturbance levels and exposure. Between 1 in 50 and 1 in 100 trees with roost potential.	Moderately high insect abundance. Native woodland/trees/hedgerows offering some shelter and edge habitat. Fast flowing freshwater features offering little shelter.	Partly discontinuous feature (gaps up to 30m wide) offering some shelter and/or foraging opportunities.

Bat Habitat Value	Roosting	Foraging	Commuting
Low	No suitable roost sites or access points visible. Less than 1 tree in 100 has roost potential due to age or tree type. High disturbance levels.	Coniferous woodland, improved agricultural land or built up areas with low plant diversity and/or insect abundance. Lack of shelter, poorly connected to roost sites and commuting routes. High disturbance levels from lighting, pollutants or human activity.	Discontinuous feature (gaps greater than 30m wide) offering no shelter and/or isolated from potential roosting and/or foraging areas.

3.4.4 Roost Survey: Building

In line with current guidelines (Hundt 2012), all buildings within 200m of proposed turbine locations were assessed from the outside with a view to establishing a 50m buffer zone around all structures with potential for roosting bats.

Buildings were then allocated to one of the following categories:

- Confirmed: Confirmed signs of bat presence/occupation and/or actual bat presence;
- High Potential: Features present with high potential to support roosting bats. These include structures with points of access to the interior through degraded/ missing mortar or brickwork, proximity to good foraging habitat such as woodland or water, suitable crevices and dense ivy cover;
- Moderate Potential: Features present that are able to support small numbers of roosting bats such as males in summer or winter;
- Low Potential: Limited roosting potential. Few features of bat interest. Structures in good condition with no access into the interior visible; and
- Negligible: Roosting bats very unlikely to be present. Includes structures built using unsuitable materials e.g. prefabricated steel with no entrance opportunities.

3.4.5 Roost Bat Activity Line Transects

A single bat activity line transect was established within the proposed Development Area encompassing the potential wind turbine envelope. The transect route was selected following the initial walkover survey in order to incorporate habitat features with potential for use by foraging and commuting bats including broad-leaved woodland, broad-leaved woodland/forest edge, hedgerows, lines of trees, scattered

trees, watercourses, water bodies, rough grassland and scrub margins (BCT 2007; Hundt 2012; Natural England 2014).

The bat activity line transect was walked three times: twice at dusk (on 21 May 2014 and 14 July 2014) and once at dawn (on 24 September 2014) with slight variations in route. This resulted in a total of nine survey hours.

The transects conducted in May (Figure 4) and July (Figure 5) were walked at an even, slow pace starting approximately 30 minutes before dusk and lasting for 2.5 hours after dusk. The transect conducted in September (Figure 6) was walked at an even, slow pace starting approximately three hours before dawn and finishing at sunrise.

Bat detectors were angled towards the sky. Transects were alternately reversed to take into account the different emergence times for each bat species (BCT 2007; Hundt 2012; Natural England 2014).

Each transect included 10 five minute listening stops evenly spread across the survey area, approximately 15 to 20 minutes walk apart. The listening stops were selected by the surveyor during the initial walkover survey and were chosen for their potential suitability for foraging or commuting bats: i.e. representing habitats such as wetland, forest edge, linear features, watercourses and water bodies (BCT 2007; Hundt 2012; Natural England 2014).

The timing of the transect surveys was designed to ensure that they were evenly spread over the summer months (Hundt 2012; Natural England 2014). However, as described in the Section 3.4.5.2 Survey Constraints, surveys were carried out under the best conditions available within the survey time-frame and within the access constraints of the project.

Frequency division (Anabat SD1) bat detectors were used to record bat activity. Weather conditions were monitored using a handheld thermometer and visual assessment.

The data collected during the bat activity transects was used to estimate relative bat activity. A bat activity index for the site was calculated by dividing bat passes by the number of survey hours (BCT 2011; Hundt 2012).

3.4.5.1 Remote static bat survey

Remote bat recording units (Anabat Express, Titley Electronics) were erected at a total of four locations with the aim of collecting a minimum of 30 nights of bat data between May and September 2014. Two remote recording units were deployed in May, July and September. One remote recording unit was located near the centre of the site whilst a second unit was moved to a different location with suitable habitat each visit in order to maximize the spread of bat activity data collected across the site (Figures 4 to 6). All remote bat recording units were attached to an existing fence post and angled towards the sky.

Remote bat detectors were set to start recording 30 minutes before dusk and switch off 30 minutes after dawn (BCT 2007; Hundt 2012; Natural England 2014).

The data collected during the remote bat detector survey was used to estimate relative bat activity. A bat activity index for the site was calculated by dividing bat passes by the number of survey days (Hundt 2012).

4 Baseline Results

The preliminary baseline results are discussed in detail below. Each potential Valued Ecological Receptor (VER) is discussed in turn. These results may be used to inform a full Ecological Impact Assessment (EcIA) for inclusion in an Environmental Statement (ES) to accompany a full Planning Application. A structured and robust assessment of potential effects has not been undertaken as part of this report.

Correspondence with consultees is located in Appendix 2. Photographs quoted in the text of this report are located in Appendix 3 and Figures in Appendix 4.

4.1 Designated Sites

Consultation and a search of available digital datasets indicates that there are no statutory designations of European importance (e.g. Special Areas of Conservation [SAC]), national importance (e.g. Sites of Special Scientific Interest [SSSI]) or non-statutory local importance (e.g. Local Nature Reserves) within the proposed site boundary. Table 2 provides details of statutory designations of European importance within 20km and sites of national importance within 5km. Full citations for statutory designated sites can be requested from Caledonian Conservation Ltd or can be obtained at http://www.snh.org.uk/snhi/.

Table 2. Designated Sites

Designation	Site name	Distance (km)	Comments
Site of Special Scientific Interest (SSSI)	Newlands of Geise Mire	2.5km SE	Supports a nationally important example of valley fen habitat. There is no pathway for effect as identified in this report.
SSSI	Loch Lieurary	3.4km S	Designated as a representative of basin fen habitat. There is no pathway for effect as identified in this report.
SSSI	Westfield Bridge	3.6km S	Supports nationally important habitats including: - Fen meadow - Lowland calcareous grassland There is no pathway for effect as identified in this report.

Designation	Site name	Distance (km)	Comments
Special Area of Conservation (SAC)	River Thurso	4.4km ESE	Supports an internationally important population of Atlantic salmon (listed under Annex II of the Habitats Directive). There is no pathway for effect as identified in this report.
SSSI	River Thurso	4.4km ESE	Supports the nationally rare flood-plain fen habitat. Supports a variety of nationally rare vascular plants. There is no pathway for effect as identified in this report.
SAC	Broubster Leans	6.4km SSW	Supports internationally important mire habitat. There is no pathway for effect as identified in this report.

Designation	Site name	Distance (km)	Comments
SAC	Caithness and Sutherland Peatlands	9.3km S	Supports a range of internationally important habitats listed under Annex I of the Habitats Directive including: - Depressions on peat substrates - Blanket bog - Wet heathland - Wet mires - Acid peat-stained lakes and ponds - Clear-water lakes with aquatic vegetation and poor to moderate nutrient levels Also supports internationally rare species listed under Annex II of the Habitats Directive, including: - Otter - Marsh saxifrage It is possible that otters associated with this SAC may forage within the proposed development site. There is no pathway for effect on other features as identified in this report.
SAC	Loch Watten	17.2km SE	Supports internationally important nutrient-rich water dominated by pondweed (habitat listed under Annex I of the Habitats Directive). There is no pathway for effect as identified in this report.

4.2 Desk-based Study and Consultation

A search of the NBN Gateway was completed. There were no records of protected species on the site although records for otter, water vole and pine marten were found in the same 10km square.

It must be noted that this data search cannot be used to inform an EA or EcIA, due to restrictions of use. Furthermore, additional data not included in the NBN dataset may be available from other data providers. Therefore, a full formal desk study should be undertaken before the submission of a planning application, which will involve

purchasing data. We strongly recommend this is undertaken at the earliest opportunity.

SNH responded to the consultation document. The full response is provided in Appendix 2. Particular comments of note are summarised below:

- Bat surveys should be undertaken in each season (spring, summer and autumn);
- Bat roost assessments should be undertaken within a 200m buffer surrounding the site boundary (agreeing that a 50m buffer is adequate when siting turbines); and
- Bat transects should begin 30 minutes before sunset and 30 minutes after sunrise.

All of these recommendations have been implemented in this study.

4.3 Extended Phase 1 Habitat Survey

4.3.1 Phase 1 Habitats

Overall, 14 habitats were identified and mapped during the Phase 1 Habitat Survey (fences and removed boundaries do not constitute habitats). There was little rain in the days leading up to the survey which was undertaken in optimum conditions. Weather details are provided in Table A1.1 (Appendix 1).

A summary of habitats and target notes are provided in Tables 3 and A1.2 respectively, and these are shown in Figure 7.

Table 3. Phase 1 Habitat Survey summary (see Figure 7).

Phase 1 Code	Description
A2.2	Scattered scrub
B1.2	Semi-improved acid grassland
B4	Improved grassland
B5	Marsh/marshy grassland
B6	Poor semi-improved grassland
D1	Dry dwarf shrub heath
D2	Wet dwarf shrub heath
D6	Dry heath/acid grassland mosaic
E2.1	Acid flush
F1	Swamp
G2	Running water
I2.1	Quarry

Phase 1 Code	Description
J2.4	Fence
J2.7	Boundary removed
J3.6	Building
J5	Other (Track)

4.3.1.1 A2.2 Scattered scrub

Ulex europaeus (gorse) is found throughout the site but is most abundant in the north-west of the site. The more exposed individuals on Hill of Forss are stunted compared to those of the lower pastures where denser stands have developed. Hill of Forss is used for sheep grazing and *U. europaeus* is particularly palatable to livestock (Averis 2013), therefore the densest stands of *U. europaeus* are confined to field margins and steep stream banks inaccessible to sheep (Photo 1).

4.3.1.2 B1.2 Semi-improved acid grassland

Much of the soils on Hill of Forss are acidic, however after many years of enrichment from livestock grazing some of the acidic character of the grassland has been lost. Species in this habitat include *Festuca ovina* (sheep's fescue), *F. rubra* (red fescue), Nardus stricta (mat grass), *Anthoxanthum odoratum* (sweet vernal-grass), *Potentilla erecta* (tormentil) and *Galium saxatile* (heath bedstraw). In wetter areas *Deschampsia cespitosa* (tufted hair-grass) and *Cirsium palustre* (marsh thistle) become more prevalent.

Only small areas of this habitat exist onsite at altitudes between improved and wet heath.

4.3.1.3 B4 Improved grassland

Almost half of habitat onsite is improved grassland, used primarily for grazing livestock. Improved grasslands have been so influenced by grazing and soil enrichment that most of the original plant species have been lost, resulting in a monotonous sward of low species diversity.

Lolium perenne (perennial rye-grass) is tolerant to both grazing and trampling and is therefore the most dominant species of this habitat. *Cynosurus cristatus* (crested dog's-tail) is also present, another common component of grazed grasslands. *Holcus lanatus* (Yorkshire fog) is found throughout the improved grassland onsite and is representative of agricultural improvement of the soils (Averis 2013).

Other species found that are indicative of improved neutral soils include *Trifolium repens* (white clover), *Ranunculus acris (*meadow buttercup) *R. repens* (creeping buttercup) with *Juncus effusus* (soft rush) and *Cirsium palustre* in the wetter areas.

4.3.1.4 B5 Marsh/marshy grassland

Marshy grassland is present where the drainage channels from the higher slopes plateau and soils become much wetter. *Juncus effusus* is dominant in these habitats as it is common in heavily grazed areas. Other species include *Molinia caerulea* (purple moor-grass), *Cirsium palustre* and *Ranunculus repens*.

4.3.1.5 D1 Dry dwarf shrub heath

This habitat is limited in extent, confined to the summit of Raven's Hill in the east of the site. The habitat is at the highest elevation onsite, on gravelly, well-drained soil. Due to its exposure to extreme weather conditions the habitat is only grazed during the summer months. Tough dwarf shrub species and lichens such as *Calluna vulgaris* (ling heather), *Erica cinerea* (bell heather), *Empetrum nigrum* (crowberry) and *Cladonia* lichen species dominate with some stunted *Ulex europaeus* (Photo 2).

Anthoxanthum odoratum and *Juncus squarrosus* (heath rush) are also present within this habitat.

4.3.1.6 D2 Wet dwarf shrub heath

The majority of high elevation habitat onsite is wet heath, defined by having over 25% coverage of either *Calluna vulgaris* or *Erica tetralix* (cross-leaved heath) (JNCC 2007). Within this expansive habitat are variations in plant species and hydrology.

The drier areas of this wet heath have a higher incidence of *C. vulgaris* compared to *E. tetralix*, with *Trichophorum germanicum* (deergrass), *Eriophorum angustifolium*, *Dactylorhiza maculata* (heath-spotted orchid), *Carex flacca* (glaucous sedge) and *Juncus squarrosus* are also present (Photo 3). This species group was located on the more exposed soils with slightly better drainage.

In the wetter areas, *E. angustifolium* begins to become more prevalent along with *Pinguicula vulgaris* (butterwort), *Narthecium ossifragum* (bog asphodel) and round-*Drosera rotundifolia* (round-leaved sundew). These areas were found near drainage channels and sinks, such as the F1 Swamp, E2.1 Acid flush and G2 Running water.

4.3.1.7 D6 Wet heath/acid grassland

Towards the north-west of the site where the hill side begins to become more sheltered there is an increase in grazing pressure from sheep. *Calluna vulgaris* is palatable to livestock and begins to be outcompeted by grazing resistant grassland species forming a mosaic of the two habitats. This habitat is made up of 60% heathland and 40% improved acid grassland.

4.3.1.8 E2.1 Acid flush

Acid flushes form on gently sloping ground feeding from groundwater, making them minerotrophic and soligenous. The acid flush onsite is sourced from the small pond just south of the quarry and is dominated by *Sphagnum* spp. (including *Sphagnum auriculatum* and *Sphagnum fallax*) and *Eriophorum angustifolium* (Photo 4). Less dominant species include *Carex nigra* (common sedge), *C. flacca* and *C. panicea* (carnation sedge).

4.3.1.9 F1 Swamp

The pond near Hill of Forss has suffered from encroachment by swamp species, gradually reducing the percentage of open water (currently less than 50% open water). This succession will eventually create a fen. The dominant species occupying the swamp is *Carex rostrata* (bottle sedge) followed by *Equisetum pratense* (marsh horsetail) (Photo 5). Also present are *Juncus effusus, Dactylorhiza purpurella* (northern-marsh orchid, *Potentilla palustris* (marsh cinquefoil) and *Caltha palustris* (marsh marigold).

4.3.1.10 G2 Running water

There are natural and man-made watercourses running throughout the site. In the upland areas the watercourses are natural channels and unproductive (Photo 6). Where the site is divided in to fields the streams have been redirected along the margins forming straight lines. The soil on Hill of Forss is thin and most watercourses have eroded through to the horizontally layered bedrock.

4.3.1.11 I2.1 Quarry

The bedrock, red sandstone, is exposed near the highest point of Hill of Forss. The rock has been mined, broken up and then used to build the track that runs around the site to the barns.

4.3.1.12 J2.4 Fence

Fences are present throughout the site dividing land parcels. They offer little to no ecological value to the site.

4.3.1.13 J2.7 Boundary removed

These are fence-lines or walls that have been removed and are included for completeness.

4.3.1.14 J3.6 Buildings

There are two houses and two barns onsite. The barns are used for storing equipment, animal feed and lambing.

4.3.1.15 J5 Other

This category represents the driveways of the two houses onsite.

4.3.2 Protected Species

The following sections describe the findings of the protected species survey.

4.3.2.1 Otter

No field signs for otters were found onsite or in the wider survey area.

The upland habitat onsite is a harsh exposed environment consisting of wet heath and small streams. Upland heaths and streams lack the production capacity for fish and amphibians, making it unlikely that otters will travel on to the site to forage (Photo 6). Coastal ecosystems are renowned for being far more productive (Kruuk 1995; Chanin 2013) than upland sites, and would therefore be more attractive to otters in Caithness. When the sea state is rough otters are known to come inland for shelter until calmer seas return (Kruuk 1995). Otters are likely to travel inland via watercourses (rather than climbing the Caithness sea cliffs) of which Forss Water is the closest (over 1.5km from site). The inland habitat surrounding Forss Water is far preferable to the habitat offered by Hill of Forss, making it more unlikely still that otters would be present onsite.

4.3.2.2 Water vole

No water vole field signs were found onsite, which provides unsuitable habitat. Water voles prefer habitat with wide swathes of bankside and emergent vegetation, easily dug earth for burrowing and slow-flowing deep water (Harris *et al.* 2009; Strachan *et al.* 2011). The land onsite is used for sheep grazing resulting in closely cropped, improved grassland throughout most of the site and reducing vegetation cover (Photo 6). The soils are very thin due to animal erosion and weathering, atop bedrock, and the watercourses are often shallow, steep and fast-flowing. More suitable habitat for water vole is found at lower elevations along the banks of the Forss Water over 1.5km.

4.3.2.3 Badger

No field signs of badger were found onsite. There are no badger records within 10km of the site. Important factors for sett location include cover, a slope and a substrate that can be dug and which drains easily (Roper 2010). Of these factors a soft substrate is the prerequisite for the establishment of badger setts and such substrate is not found onsite.

Although limited cover and a slope are present, the site comprises mostly of a thin rocky soil that is just deep enough to cover the bedrock, therefore providing no suitability for sett construction. Soft peat is present onsite, however this is often waterlogged due to the lack of drainage and high rainfall and therefore also unsuitable.

Due to the dearth of suitable habitat, the absence of field signs and an absence of historic records within 10km of the area it is extremely unlikely that badgers frequent the site.

4.3.2.4 Pine marten

No field signs of pine marten were found onsite. The records that exist within the same 10km square are located in the forestry south of Dounreay (over 5km from site). Studies have shown that male pine marten territories in fragmented upland coniferous woodland can be very large (23.63km^2), and even female territories can

be large in this environment (8.83km^2) (Caryl 2008). Therefore it is not impossible for pine martens to reach the site, however, the sub-optimal foraging offered by the site make this improbable.

A study by Birks *et al*. (2005) showed that when arboreal dens are limited in supply, terrestrial dens located in rocks or uprooted trees are chosen. There are no trees onsite, therefore restricting martens to terrestrial dens (Figure 7). Pine martens are susceptible to predation by the red fox (*Vulpes vulpes*) (Birks *et al.* 2005), from which several scats were found onsite. The limited availability of arboreal dens and red fox presence suggests that risk of predation is high and that pine marten dens being found onsite is unlikely.

Due to the deficiency of arboreal dens available and a population of foxes present, and lack of food source, it is also unlikely that pine martens will visit the site.

4.4 National Vegetation Classification Survey

Target notes and quadrat data are located in Tables A1.3 to A1.13 in Appendix 1.

4.4.1 Overview

An initial walkover of the site showed the majority of the higher ground onsite consists of communities of the NVC type M15 *Trichophorum germanicum - Erica tetralix* wet heath (Figure 8). The higher ground onsite is characterised by a patchwork of slightly elevated hummocks of ericoid shrubs and grass with damper depressions and channels containing sedges running between.

On drier areas, mostly to the east around Raven's Hill, the typical M15 community forms a mosaic with H10 *Calluna vulgaris - Erica cinerea* dry heath with veins of small sedge mire (SSM - no NVC community) and areas of the wetter M15a *Carex panicea* sub-community.

This mosaic of wet and dry heath occurs further west but as the ground becomes wetter the M15a sub-community becomes more dominant along with small sedge mires. Attempts to drain this ground, particularly at the south-west corner of the site, have created a rough grid of shallow drainage channels containing small sedge mires. Between the channels the ground is occupied by a mosaic of M15 (typical community) and H10 dry heath with occasional stands of the acid grassland community U5c *Nardus stricta - Galium saxatile*.

A large pond is situated in the southern part of the site, occupied by the communities of S27*Carex rostrata - Potentilla palustris* and S9 *Carex rostrata* swamps.

This pond drains southwards and also eastwards into an area of mire (Mvar - no NVC community). This in turn drains into a small burn which then forms pools dominated by *Potentilla palustris* (marsh cinquefoil) and *Ranunculus flammula* (lesser spearwort) (with similarities to the S27a sub-community). The burn then trickles southward through a mosaic of M15a and small sedge mire communities.

From the high ground, slopes descend gently northward with M15 wet heath mixed with U5c *Nardus stricta* grasslands. Lower down this gives way to U4b *Festuca ovina - Agrostis capillaris - Galium saxatile* grassland and eventually, in the enclosed fields to the north, improved grasslands of MG6 *Lolium perenne - Cynosurus cristatus* are found.

Stunted patches of W23 *Ulex europeaus* scrub dot the higher areas of the site and a large patch occurs at the western edge of the site. Rush patches of MG10 *Holcus*

lanatus - Juncus effusus occur in the lower grassland and an area of M23 *Juncus effusus/acutiflorus - Galium palustre* is situated where a large burn drains toward the western boundary of the site. Patches of OV25 *Urtica dioica* and *Cirsium arvense* line mounds of slurry or where animal droppings are frequent. A small pond of *Equisetum fluviatile* (S10) occurs toward the south-east of the site and a small area of M17 *Trichophorum germanicum - Eriophorum vaginatum* blanket mire occurs around a flat area at the west end of the site at c.ND063682.

The site has been heavily modified through grazing, burning and drainage and much of the habitat is in poor condition (Photo 7). The site shows some moderate base enrichment, possibly through human activity, notably the rough track where either more base rich rocks have been exposed or such materials have been imported for construction. The sedge mires and flushes show evidence of moderate base enrichment and contain a few calcicolous plant species such as *Carex dioica* (dioecious sedge), *Carex viridula* ssp. *lepidocarpa* (yellow sedge), *Linum catharticum* (fairy flax) and the sphagnum species *Sphagnum angustifolia* and *Sphagnum stellatum*.

4.4.2 Community Descriptions

The study area at Hill of Forss was found to contain 17 separate plant communities (with their sub-communities). These are categorised below according to their conservation interest with regard to the Habitats Directive and to their SEPA designation for Groundwater Dependency.

4.4.2.1 Annex I Communities

Annex I 4010 North Atlantic wet heaths

M15 *Trichophorum germanicum - Erica tetralix* wet heath. This community mostly falls into two broad sub-communities here, the typical M15b community of *Trichophorum germanicum* (deergrass), *Calluna vulgaris* (ling heather) and *Erica tetralix* (cross-leaved heath) (Photo 8) and the wetter, sedge dominated *Carex panicea* (carnation sedge) sub-community M15a. M15 occurs across most of the higher ground of the site on damp ground. It forms a mosaic with the drier faint hummocks of H10 dry heath and occasional stunted patches of *Ulex europeaus* (gorse) around Raven's Hill. M15a forms an intricate maze of small flushes, trampled areas and patches of wet ground across the same area. The composition of this mosaic of heathland depends on topography, better drained areas favour the drier M15b sub-community and dry heath (H10) while depressions and flushed areas with moderate base enrichment favour M15a. As the ground becomes wetter still M15a fades into small sedge mires (SSM – no NVC community) as ericoid cover is lost and mildly calcicolous sedges become more common. A third sub-community of M15c wet heath occurs in fragments on the driest parts of the site. M15 wet heath is globally rare, hence its status as a habitat of international importance, although it does not provide outstanding habitat for upland birds (Averis *et al*. 2004). Most of the wet heath onsite is in poor condition, much trampled and grazed with a good deal of bare ground and prostrate vegetation. On some of the more exposed parts of the site, particularly at the western boundary, the prostrate nature of the vegetation may

be due to some wind clipping combined with grazing and trampling. However, over the majority of the site overgrazing, trampling and burning are responsible for the impoverishment of the wet heath.

Mvar *Eriophorum angustifolium - Schoenus nigricans* mire (no NVC community).

This mire is dominated by large stands of *Eriophorum angustifolium* (common cotton-grass) with a blanket of sphagnum species including *Sphagnum papillosum* and *S. subnitens*, fringed with tussocks of *Schoenus nigricans* (black bog-rush) (Photo 9). The vegetation does not fit into any NVC community description although it has similarities in composition with those associated with southern, shallow valley mires such as M21 *Narthecium ossifragum - Sphagnum papillosum* mire and M14 *Schoenus nigricans - Narthecium ossifragum*. *Eriophorum angustifolium* can also dominate heavily modified areas of blanket mire and the area may historically have been blanket mire before being heavily modified. *Schoenus nigricans* also occurs frequently in mire vegetation in Scotland in flushed areas of mire and heath (Rodwell 1991b). Overall the area is best described as a heavily modified area of flushed M15.

Annex I 7130 Blanket Bogs

M17b *Trichophorum germanicum - Eriphorum vaginatum* blanket mire.

A small area of M17 occurs to the west of the large pond c.ND060986. It has its closest affinity to the M17b *Cladonia* sub-community, and has probably been modified somewhat by drainage and burning. Due to its global rarity, along with other blanket bog communities, M17 is considered to be of great ecological and conservation importance (Averis *et al*. 2004). It can be an important habitat for invertebrates as well as nesting waders such as dunlin (*Calidris alpina*) and greenshank (*Tringa nebularia*) (Averis *et al.* 2004). However the area of bog onsite is small, occupying an area of approximately 0.1 hectares.

Annex I 4030 European Dry Heaths

H10 *Calluna vulgaris - Erica cinerea* heath. This vegetation type is found on the better drained areas of the high ground, mostly around Raven's Hill. It consists of the typical sub-community, being fairly species poor with occasional tufts of *Carex binervis* (green-ribbed sedge) (Rodwell 1991b). The presence of the grasses *Anthoxanthum odoratum* (sweet vernal-grass) and *Festuca ovina* (sheep's fescue) as well as herbaceous plants such as *Polygala serpillifolia* (heath milkwort) not typically found in the H10 community likely reflects the fine mosaic of acid grassland and wet heath found with this vegetation type.

Annex I 7140 Fens

S27 *Carex rostrata - Potentilla palustre* swamp

The large shallow pond at c.ND066685 consists of two swamp communities dominated by *Carex rostrata* (bottle sedge) (Photo 5). A species poor S27a sub-community occurs in small areas of the shallow margins of the pond showing some signs of base enrichment through the presence of *Selaginella selaginoides* (lesser club-moss) and the moss *Scorpidium revolvens.* Stands of pure *C. rostrata* (S9) and *Equisetum palustre* (marsh horsetail) (no NVC community) replace this community in deeper water and the area covered by S27a is small, being less than 5% of the pond.

4.4.2.2 Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

Of the 62 vegetation communities identified by SEPA as being potentially groundwater dependent wetlands, eight have been recorded onsite:

4.4.2.2.1 Highly Groundwater Dependent Terrestrial Ecosystems

No wetlands of high groundwater dependency were found onsite.

4.4.2.2.2 Moderately Groundwater Dependent Terrestrial Ecosystems

Three vegetation communities have been recorded at Hill of Forss that are considered to be Moderately Groundwater-Dependent:

- M15 *Trichophorum germanicum - Erica tetralix* wet heath. This community is described in Section 4.4.2.1.
- M23 *Juncus effusus/acutiflorus - Galium palustre* rush pasture. This is a community of acid to neutral damp soils and is found onsite in the lower northern part of the site. It has no particular conservation importance but does provide cover for bird species such as curlew (*Numenius arquata*), snipe and lapwing (*Vanellus vanellus*) (Averis *et al*. 2004).
- MG10 *Holcus lanatus - Juncus effusus* rush pasture. A small patch of MG10 *Holcus lanatus - Juncus effusus* occurs in the grassland of the north of the site, it has no real conservation interest.

4.4.2.2.3 Wetlands of Low Groundwater Dependency

Five vegetation communities have been recorded at Hill of Forss that are considered to be of Low Groundwater Dependency:

- M17 *Trichophorum germanicum - Eriphorum vaginatum* blanket mire. This community is described in Section 4.4.2.1.
- S9 *Carex rostrata* swamp. The deeper part of the large pond contains the S9 community, dominated by swards of emergent *Carex rostrata* along with *Equisetum palustre*. S9 has no protected status although, along with the S27 community described above, it can offer cover for water birds such as teal (*Annas crecca*) and coots *(Fulica atra*) (Averis *et a*l. 2004).
- S10 *Equisetum fluviatile* swamp. A small pond of S10a with a pure stand of *Equisetum fluviatile* occurs onsite at ND0678368865. This community is one of a few near natural swamp communities in the British upland although it does not have a protected status (Averis *et al.* 2004). S10 swamps are susceptible to drainage and agricultural runoff.
- S27 *Carex rostrata - Potentilla* palustre swamp. This community is described in Section 4.4.2.1.
- Svar *Potentilla palustre* swamp. The nascent burn draining southward from the mires forms shallow pools at c.ND068687 where a swamp community occurs labelled here Svar as it does not conform to any NVC community. The swamp is dominated by patches of *Potentilla palustris* and *Ranunculus flammula* although it lacks the *C. rostrata* of S27.

4.4.2.3 Other Communities

- Small Sedge Mires (SSM). The various water channels eroded into the peat at the southern end of the site, as well as ditches dug to drain the site have small sedge communities dominated by *Carex panicea* with other sedges such as *C. viridula* ssp. *lepidocarpa, C. nigra* (common sedge) and *C. pulicaris* (flea sedge) (Photo 11). These mires do not correspond to any NVC communities although they are similar to very wet communities of the *Carex panicea* sub-community of M15a. This may be due to modification through human activities onsite particularly through base enrichment although it is worth noting that not all small sedge communities are described in the NVC (Averis *et al.* 2004).
- *Carex nigra* mire. Two small patches of very wet ground at the east of the site, close to the boundary are dominated by *Carex nigra* (Photo 12).
- U5 *Nardus stricta – Galium saxatile* grassland. The northern slopes of the site grade downward from heathland into acid grassland with *Nardus stricta* grassland of the U5c *Viola riviniana* sub-community occurring at higher elevations than other grassland types. U5 grassland does not have a protected status although it does provide important habitat for skylarks (*Alauda arvensis*) and meadow pipits (*Anthus pratensis*) (Averis *et al*. 2004) both species of which are found onsite.
- U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland. Lower down the northern slope of the site U5 grassland gives way to grassland of the U4 *Festuca ovina – Agrostis capillaris – Galium saxatile*. The grassland here is of the U4b *Holcus lanatus - Trifolium repens* sub-community. It has no particular conservation concern although, like the *N. stricta* grassland, it provides breeding habitat for skylarks (Averis *et al*. 2004).
- MG6 *Lolium perenne – Cynosurus cristatus* grassland. The improved and heavily grazed MG6 *Lolium perenne – Cynosurus cristatus* grassland occurs in the enclosed fields at the north end of the site. It has no particular conservation interest.
- W23 *Ulex europaeus – Rubus fruticosus* scrub. Scrub of *Ulex europaeus* occupies an area to the north-west of the open land as well as the banks of drainage ditches and streams, it also forms hedgerows to some of the enclosed fields at the north of the site. It has no particular conservation concern but provides cover for songbirds such as yellowhammer (*Emberzia citronella*) and stonechat (*Saxicola rubetra*) (Averis *et al*. 2004).

4.5 Bats

4.5.1 Desk-Based Study

A data search was completed which found records of bats within 10km of the site included common pipistrelle, soprano pipistrelle and Daubenton's bat (see Table 4).

Recent research suggests that Nathusius' pipistrelle (*Pipistrellus nathusii*), a species of bat that is considered to be at high risk of collision with wind turbines (Natural England 2009), is more abundant in the UK than previously thought. Records of Nathusius' pipistrelle bats recorded on North Sea oil rigs, on the Shetland and Orkney Islands and along the east coast of Scotland and north-eastern England in

September suggest that this species may be migratory in these parts of the UK (Russ *et al*. 2001; Russ 2012).

However, the desktop survey did not identify any records of Nathusius' pipistrelle within 10km of the proposed wind farm. In addition, a survey completed in September 2011 as part of the National Bat Wind Farm Survey which involved attaching remote bat detectors to turbines at Forss Wind Farm, located approximately 2.8km west, recorded low numbers of bat species. The species recorded here were those known to be of low or medium risk of collision with wind turbines, including common pipistrelle, soprano pipistrelle, *Pipistrellus* spp., *Myotis* spp. and brown long-eared bats.

It should also be noted that the site is located on the north coast of Scotland and high flying, high risk bat species such as noctule (*Nyctalus noctula*) and Leisler's (*N. leisleri*) have not been recorded in the area (Richardson 2000; Natural England 2014).

Table 4. Summary of bat records reported during desk top survey.

Common name	Date recorded	Site Name	Grid reference	Distance from Site	Type of record
Soprano pipistrelle	06/05/2009	Bridge of Forss	ND036687	1.5km	Foraging
Daubenton's bat	06/05/2009	Bridge of Forss	ND036687	1.5km	Foraging
Common pipistrelle	06/05/2009	Bridge of Forss	ND036687	1.5km	Foraging
Common pipistrelle	14/06/2000 21/06/2000 06/06/2002 18/06/2002	Shebster	ND0264	6.2km	Roost

4.5.2 Bat Habitat Assessment Survey

Figure 3 shows the results of the bat habitat assessment survey (for further habitat details refer to Phase 1 Habitat Survey results reported in Section 4.3.1 and shown in Figure 7).

4.5.2.1 Foraging Habitat

The majority of the survey area consisted predominantly of an upland heath/acid grassland mosaic with smaller areas of marshy grassland and improved grassland. A small pond was located near the centre of the site. There were no trees or broad-leaved woodland within the site boundary. The majority of the site was also very open and windswept with poor commuting route potential (Figure 3).

As a result the majority of the site was assessed as being of low potential for foraging bats (Walsh and Harris 1996a, 1996b; Jenkins *et al* 1998) (Photo 7).

However, the hedges found to the north-west of the site offered shelter for a variety of insect species. As a result these areas were assessed as being of medium value for foraging bats (Walsh and Harris 1996a, 1996b; Jenkins *et al* 1998).

4.5.2.2 Commuting Habitat

Linear features such as hedges, dry stone dykes and small water courses located within the survey area all provided medium value commuting opportunities for bats moving over the site (Walsh and Harris 1996a, 1996b; Jenkins *et al* 1998) (Photo 13).

4.5.2.3 Roosting Habitat

Other than the buildings located on the A836 and the single derelict farm building at grid reference ND060691 (see Section 4.5.3), there were no potential roosting sites (such as trees, tunnels, caves or mines) within 200m of the site. As a result the majority of the site was assessed as having low value for roosting bats (Hundt 2012; Boonman 2000; Cowan 2006).

4.5.3 Roost Surveys: Buildings

There were several individual or groups of buildings located on the A836 which were outside the site boundary but within 200m of the site (see Photos 14 - 16). All of these buildings were assessed as having high potential for roosting bats.

A single derelict farm building at grid reference ND060691 (Photo 17) was also assessed as having high potential for roosting bats.

4.5.4 Bat Activity Line Transects

A total of three transect surveys were conducted in May, July and September (see Table 5).

Table 5. Summary of Bat Activity: Line Transect.

Date of Survey	Species Recorded	Number of bat passes
21 May 2014 Dusk	No bats recorded	0
14 July 2014 (Dusk)	No bats recorded	0
24 September 2014 (Dawn)	Natterer's bat	1 (faint)

Only one faint Natterer's bat pass was recorded during the bat activity transects (Figure 9). This was recorded at 0439hrs on 24 September 2014. This equates to 0.11 bat passes for every one hour of survey effort (one bat pass / nine hours = 0.11).

No other bats were recorded during the course of the three transects.

4.5.5 Remote Bat Detector Surveys

A total of 36 nights of data were recorded during the course of the remote static bat detector surveys (see Table 6).

Table 6. Summary of Bat Activity recorded by Static Remote bat detectors

Date of Survey 2014	No of nights	Location	Species Recorded	Number of bat passes
May 18/19 to 22/23	5	1	Daubenton's bat	1
			Common pipistrelle	3
May 18/19 to 22/23	5	2	No bats recorded	0
July 10/11 to 14/15	5	1	Common pipistrelle	61
July 10/11 to 14/15	5	3	*Myotis* sp.	2
			Common pipistrelle	2
September 15/16 to 22/23	8	1	Soprano pipistrelle	6
			Common pipistrelle	22
			Natterer's bat	1
September 15/16 to 22/23	8	4	Common pipistrelle	10

Four species of bat were recorded including common pipistrelle, soprano pipistrelle, Daubenton's bat and Natterer's bat.

The most abundant species recorded during the survey was common pipistrelle with a total of 98 bat passes. This equates to an average of 2.72 bat passes per survey night.

The second most abundant species recorded during the survey was the soprano pipistrelle, with a total of 6 bat passes recorded. This equates to an average of 0.17 bat passes per survey night.

Just one Daubenton's bat and one Natterer's bat were recorded during the survey, equating to 0.03 bat passes per survey night for each species.

Two unidentified *Myotis* bats were also recorded during the survey which equates to 0.05 bat passes per survey night.

The highest numbers of bats (94 bat passes) were recorded at Remote Bat Detector Location 1 which overlooked a pond near the centre of the site.

Remote Bat Detector Locations 2, 3 and 4 were located on fence posts overlooking open ground and recorded 0, 2 and 10 bat passes respectively.

4.6 Survey Limitations

The Extended Phase 1 Habitat Survey and NVC survey were completed under ideal conditions.

Liaising with the Civil Nuclear Constabulary situated at Dounreay was necessary to organise bat surveys during hours of darkness. Visits had to be arranged between 2 and 4 weeks in advance and access was prohibited on certain days. Despite this, the required number of visits were completed within the relevant survey period (Hundt 2012).

The bat transect survey schedule was designed to ensure that they were evenly spread over the summer months. Although bats will continue to feed in poor weather conditions, including mist and light rain, best practice states that surveys should not be carried out in heavy rain, high winds or temperatures below 10°C. Surveys were, therefore, carried out under the best conditions available within the survey time-frame and within the constraints of the project. As a result, a line transect activity survey scheduled to take place at dusk on 23 September 2014 was postponed until dawn on 24 September 2014 to ensure data were collected during weather conditions that met with survey guidelines (BCT 2007; Hundt 2012; Natural England 2014).

5 Discussion and Recommendations

The most sensitive VERs identified during work were heathland and other habitatslisted under Annex I of the Habitats Directive as internationally important. These and other individual VERs are discussed in greater detail below, alongside recommendations based upon survey results.

5.1 Desk-based Study

A full formal desk study should be undertaken before the submission of a planning application, which will involve purchasing data. Data requests for information will be made with the Highland Biological Recording Group (HBRG), Scottish Badgers, Amphibian and Reptile Conservation Trust (ARC) and Caithness Biodiversity Group. This will help inform a robust environmental assessment for the application. We strongly recommend this is undertaken at the earliest opportunity.

5.2 Habitats

The Phase 1 Habitat Survey found some of the habitat onsite had potential to support GWDTEs and Annex I habitats, therefore requiring an NVC survey to identify their value. These are discussed below.

5.2.1 M15 Trichophorum germanicum - Erica tetralix *wet heath*

In terms of habitat the main sensitivity identified at Hill of Forss is M15 *Trichophorum germanicum* - *Erica tetralix* wet heath which covers much of the higher ground onsite. It is listed under Annex I of the Habitats Directive and is therefore considered to be of very high sensitivity. Furthermore, it is also considered to be a Moderately Groundwater Dependent Terrestrial Ecosystem (SEPA 2012). The M15 heath at Hill of Forss is, however, of poor quality due to overgrazing, trampling, drainage and burning.

Damage to this this heath should be minimised during construction and appropriate mitigation, as part of a Habitat Management and Monitoring Plan (HMMP), is recommended. This may include a grazing regime and the control of burning and drainage on the more elevated parts of the site where this heath is located, so as to restore this habitat and improve its biodiversity value.

5.2.2 M17 Trichophorum germanicum - Eriophorum vaginatum *blanket mire*

This mire occurs in a small patch toward the south of the site and is also listed as an Annex I habitat although it is considered to be of Low Groundwater Dependency. Tracks and other works should be micro-sited in order to avoid this area. The mire will also benefit from any mitigation involving the control of grazing, burning and drainage as part of an HMMP.

5.2.3 S27 Carex rostrata - Potentilla palustre *swamp*

S27 swamp, also an Annex I habitat, covers less than 5% of the pond found toward the centre of the site. Care should be taken to avoid destroying or draining the pond during construction, and appropriate pollution prevention plans should be followed to avoid pollution or siltation of the waterbody.

5.2.4 H10 Calluna vulgaris - Erica cinerea *heath*

The H10 dry heath, also an Annex I habitat forms a mosaic with the more dominant M15 wet heath on the higher ground around Raven's Hill although it covers very little ground. Controlling grazing and burning onsite would also provide mitigation for this habitat as part of an HMMP, although only a tiny amount of this habitat would potentially be lost to construction.

It is also recommended that, as a precaution, the habitats recorded as Mvar, Svar and SSM, which did not conform to communities recorded in the NVC, be treated as variants of M15 wet heath and therefore Annex I habitat and Moderately Groundwater Dependent. Mitigation measures controlling grazing, drainage and burning would also benefit these habitats as part of an HMMP.

5.2.5 Other habitats

The habitats of rush dominated vegetation MG10 and M23 are considered to be Moderately Groundwater Dependent, however both are commonplace and widespread and have no protected status and limited conservation value.

5.3 Otter

Although no field signs of otter were recorded during the course of the survey, otters are present in the surrounding area. Otters that live in freshwater habitats have large ranges from 12km to 80km (Chanin 2013). Therefore it is possible, although unlikely, that otters will move through the site and preconstruction surveys should be undertaken prior to construction works. It is also recommended that excavations are either covered up overnight and/or ramps provided in trenches to avoid otter becoming trapped during the construction phase. It is recommended that a suitably experienced and qualified Ecological Clerk of Works (ECoW) should be appointed to oversee construction activities, and ensure best practice is followed.

5.4 Water Vole

Habitat was not found to be suitable for water vole (Harris *et al.* 2009; Strachan *et al.* 2011), and so no further recommendations are required.

5.5 Badger

No badger setts, or other associated field signs were found onsite or in the surrounding area. The habitat present is unsuitable for sett construction or foraging

further reducing the chance of badgers to roam onsite (Roper 2010). No further recommendations are required.

5.6 Pine Marten

No field signs of pine marten were found onsite or within the surrounding area. The habitat present onsite is unsuitable for den construction but may be used for foraging. Studies have shown that pine marten territories in fragmented upland coniferous woodland can be very large (Caryl 2008), therefore, it is not impossible for pine martens to reach the site. It is therefore recommended that excavations are either covered up overnight and/or ramps provided in trenches to avoid otter becoming trapped during the construction phase. It is recommended that a suitably experienced and qualified ECoW should be appointed to oversee construction activities, and ensure best practice is followed.

5.7 Bats

Four of the five species of bat known to be found in the Caithness region were recorded during the course of the bat surveys, namely; common pipistrelle, soprano pipistrelle, Daubenton's bat and Natterer's bat.

However, it should be noted that the number of bat passes recorded for all species was extremely low, indicating that the habitat is sub-optimal for foraging and not attractive to local bat populations.

Common and soprano pipistrelle bats are well represented throughout the region. Pipistrelle bats are considered to be at medium risk of collision with wind turbines (see Table 7).

Table 7. Bat species likely to be at risk of collision with wind turbines (Natural England 2014)

Bat Species Assigned to Risk Category		
Low risk	**Medium Risk**	**High Risk**
Myotis species	Common pipistrelle	Noctule
Long-eared bats	Soprano pipistrelle	Leisler's bat
Horseshoe bats	Serotine	Nathusius' pipistrelle
	Barbastelle	

Daubenton's bat is relatively abundant in Caithness but generally only recorded foraging above wetlands. Natterer's bat is also thought to be relatively abundant in the region and is closely associated with woodland habitats.

Natterer's bat and Daubenton's bat are considered to be at low risk of collision with wind turbines (see Table 7).

All the species recorded during the course of the survey were at low and medium risk of collision with wind turbines. In addition an extremely low number of bat passes

were recorded for all species. Therefore it is unlikely that the proposed wind farm at Hill of Forss will have a measurable impact on local bat populations.

However, the following mitigation measures are recommended as a precaution to ensure that the risk of bats colliding with turbines is minimised (Natural England 2009; BCT 2012):

- Establish a minimum 50m buffer zone around all habitat assessed as having high potential for roosting bats (see Figure 3); and
- Site turbine 3 at least 50m west from its current location, away from habitat identified as being of value for foraging and commuting bats (see Figure 3 and 10).

5.8 Ecological Impact Assessment (EcIA)

We recommend that an Ecological Impact Assessment (EcIA) is undertaken. This will allow a robust assessment following an updated approach consistent with current guidance and formats now preferred by SNH and other stakeholders. The EcIA should be completed in accordance with best practice guidelines (Institute of Ecology and Environmental Management [IEEM] 2006; Regini 2000; Scottish Natural Heritage [SNH] 2009). It will also involve the development of an HMMP, which should aim to enhance biodiversity.

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APPENDIX 1: Survey Details

Table A1.1. Extended Phase 1 Habitat Survey and NVC survey visit details.

Date	Surveyor	Start Time	Hour	Visibility	Wind speed	Wind direction	Rain		Cloud cover	Cloud height	Frost	Snow
03/07/14	GN/ EF	11:00	1	2	0	NW	0		0	-	0	0
			2	2	1	NW	0		1	2	0	0
			3	2	2	NW	0		1	2	0	0
			4	2	2	NW	0		1	2	0	0
			5	2	2	NW	0		2	2	0	0
04/07/14	GN/ EF	08:30	1	2	4	NW	0		8	2	0	0
			2	2	4	NW	0		7	2	0	0
			3	2	3	NW	1		8	2	0	0

Visibility; 0 = <1km; 1 = 1-2km; 2 = ≥2km

Wind direction: according to 16-point compass

Wind strength: according to the Beaufort scale

Cloud cover: in eighths of sky

Cloud height: 0 = <150m; 1 = 150-500m; 2 = >500m

Rain: 0 = None; 1 = Drizzle/Mist; 2 = Light showers; 3 = Light rain, 4 = Heavy showers; 5 = Heavy rain

Frost: 0 = No; 1 = Yes

Snow: 0 = None; 1 = High ground; 2 = All ground

Observer: EF = Eamonn Flood; GN = Glenn Norris

Table A1.2. Phase 1 Habitat Survey target notes (shown in Figure 7).

TN	Grid reference	Details
1	ND0693968855	A small depression in the topography lacks drainage resulting in a high water table. The increased wetness causes vegetation to contrast with nearby dry heath exhibiting species such as *Eriophorum angustifolium* (common cotton-grass), *Erica tetralix* (cross-leaved heath), *Carex nigra* (common sedge) and an abundance of *Sphagnum* spp.
2	ND0680568671	A small sedge mire dominated by *Carex panicea* (carnation sedge). Other species include *Trichophorum germanicum* (deergrass), *Linum cartharticum* (fairy flax) and *Pedicularis palustris* (marsh lousewort).
3	ND0677468626	Variations in hydrology onsite resulted in differences in species abundance within wet heath communities. This area was very wet, featuring plants such as *P. palustris*, *Myosotis scorpioides* (water forget-me-not), *C. nigra*, *Geum rivali* (water avens), *Caltha palustris* (marsh marigold) and *Cardamine pratensis* (cuckooflower).

Table A1.3. Hill of Forss National Vegetation Classification Survey Target Notes (see Figure 8).

Target Note	Grid Reference	Notes
TN 1	c.ND06687	Recently burnt M15 wet heath
TN 2	ND06376885	Relatively large stream with small sedge and M10 mire
TN 3	c.ND064680	Extensive network of drainage ditches in south west corner of the site with M10 and small sedge mires
TN 4	ND06806900	Carex nigra dominated mire
TN 5	ND06906890	Carex nigra dominated mire
TN 6	c.ND054691	W23 scrub along large stream
TN 7	c.ND048689	Border of W23 scrub
TN 8	c.ND065686	Very wet area *Eriophorum angustifolium* dominated mire
TN 9	ND06796862	Relatively large stream with small sedges
TN 10	ND06766864	Small pools with affinities to S27a swamp

Quadrat	M15aQ1	M15aQ2	M15aQ3	M15aQ4	M15aQ5	M15aQ6	M15aQ7	M15aQ8	M15aQ9	M15aQ10
Grid reference	ND0623268782	ND0627368589	ND0636868655	ND0665068883	ND0685168791	ND0666068259	ND0687568870	ND0688268801	ND0690668769	ND0637769050
Eriophorum angustifolium		3			4	4		5	6	4
Euphrasia agg.				2						2
Festuca ovina				2						
Festuca rubra			3							4
Juncus articulatus										6
Juncus effusus				2		3				
Juncus squarrosus	5	7		4	6	4			4	2
Luzula multiflora	3									
Luzula multiflora ssp. *congesta*			3							
Molinia caerulea				6	4					5
Nardus stricta		5	4	4			5			
Narthecium ossifragum			5	3						2
Pedicularis palustre						1	2			

Table A1.4. M15a quadrat data.

Quadrat	M15aQ1	M15aQ2	M15aQ3	M15aQ4	M15aQ5	M15aQ6	M15aQ7	M15aQ8	M15aQ9	M15aQ10
Grid reference	ND0623268782	ND0627368589	ND0636868655	ND0665068883	ND0685168791	ND0666068259	ND0687568870	ND0688268801	ND0690668769	ND0637769050
Agrostis canina	4		4							4
Anthoxanthum odoratum			4							
Calluna vulgaris	8	7	8	4	8	7	5	5	9	
Carex binervis	3	3	4	3	4					
Carex echinata			4			5				
Carex lepidocarpa										4
Carex nigra				3		4			3	
Carex panicea	4	3	5	6	4	6	6	3		7
Carex pulicharis										4
Drosera rotundifolia				3		2				
Equisetum arvense										2
Erica cinerea							3			
Erica tetralix	4	4	3	4		5	3	4	3	

Quadrat	M15aQ1	M15aQ2	M15aQ3	M15aQ4	M15aQ5	M15aQ6	M15aQ7	M15aQ8	M15aQ9	M15aQ10
Grid reference	ND0623268782	ND0627368589	ND0636868655	ND0665068883	ND0685168791	ND0666068259	ND0687568870	ND0688268801	ND0690668769	ND0637769050
lanuginosum										
Rhytidiadelphus squarrosus		4	4	3	4					5
Sphagnum capillifolium				5	4	8				
Sphagnum fuscum						3				

Quadrat	M15aQ1	M15aQ2	M15aQ3	M15aQ4	M15aQ5	M15aQ6	M15aQ7	M15aQ8	M15aQ9	M15aQ10
Grid reference	ND0623268782	ND0627368589	ND0636868655	ND0665068883	ND0685168791	ND0666068259	ND0687568870	ND0688268801	ND0690668769	ND0637769050
Pedicularis sylvatica			2							
Pinguicula vulgaris				2						3
Potentilla erecta			4	3		5		3		
Prunella vulgaris										3
Schoenus nigricans										5
Succisa pratensis				1						3
Trichophorum germanicum	5		4	3	4	5	4	5	4	6
Cladonia ciliata		3	3		3	6	3	4	3	
Cladonia uncialis								1	3	
Hylocomium splendens	7			3					7	
Hypnum jutlandicum			7			5				
Polytrichum commune										5
Racomitrium		5	3		7			6		

Quadrat	M15bQ1	M15bQ2	M15bQ3	M15bQ4	M15bQ5	M15bQ6	M15bQ7
Grid reference	ND0689168765	ND0688468707	ND0684868615	ND0655568574	ND0652168541	ND0688268927	ND0621568715
Juncus squarrosus	5	4				4	4
Luzula multiflora ssp. *congesta*			3	2	3		
Molinia caerulea							4
Nardus stricta						3	5
Pedicularis sylvatica			2				
Potentilla erecta		3	3			2	
Succisa pratensis			3				
Trichophorum germanicum	6	4				7	4
Pseudoscleripodium purum			3				
Pleurozium schreberi						4	
Polytrichum commune					6		
Racomitrium lanuginosum	6	4					6
Rhytidiadelphus loreus	4						

Table A1.5. M15b quadrat data.

Quadrat	M15bQ1	M15bQ2	M15bQ3	M15bQ4	M15bQ5	M15bQ6	M15bQ7
Grid reference	ND0689168765	ND0688468707	ND0684868615	ND0655568574	ND0652168541	ND0688268927	ND0621568715
Agrostis canina							4
Anthoxanthum odorata			4				
Calluna vulgaris	9	9	4	4	3	7	7
Carex binervis	3		3			3	
Carex lepidocarpa			3				
Carex panicea			3				5
Carex viridula			3				
Equisetum arvense			3				
Erica cinerea							3
Erica tetralix	4	4	5	3	3	3	4
Eriophorum angustifolium			7	5	9		
Festuca rubra				3	3		3
Festuca vivipara				5	4		

Table A1.6. Mire Variant (Mvar) quadrat data.

Quadrat	MvarQ1	MvarQ2	MvarQ3	MvarQ4	M3var5	MvarQ6
Grid reference	ND0659768576	ND0659568529	ND0641868476	ND0656367974	ND0651868505	ND0656768601
Agrostis canina	4				3	
Anthoxanthum odorata				4		
Calluna vulgaris		5	6	7		3
Carex binervis				3		
Carex echinata				5		
Carex nigra	3				.	7
Drosera rotundifolia					3	
Equisetum arvense			3			
Erica tetralix	4	5	5	4	5	3
Eriophorum angustifolium	7	8	9	4	9	7
Eriophorum vaginatum	6					
Festuca ovina	3					
Festuca rubra						2

Quadrat	M15bQ1	M15bQ2	M15bQ3	M15bQ4	M15bQ5	M15bQ6	M15bQ7
Grid reference	ND0689168765	ND0688468707	ND0684868615	ND0655568574	ND0652168541	ND0688268927	ND0621568715
Rhytidiadelphus squarrosus		4					
Cladonia ciliata	3	2				7	
Cladonia uncialis						3	
Sphagnum capillifolium	3	7	9	8	5		
Bare ground						3	

Quadrat	MvarQ1	MvarQ2	MvarQ3	MvarQ4	M3var5	MvarQ6
Grid reference	ND0659768576	ND0659568529	ND0641868476	ND0656367974	ND0651868505	ND0656768601
Sphagnum fallax	6					
Sphagnum fuscum						3
Sphagnum papillosum					5	
Sphagnum subnitens	5	4	3		7	

Quadrat	MvarQ1	MvarQ2	MvarQ3	MvarQ4	M3var5	MvarQ6
Grid reference	ND0659768576	ND0659568529	ND0641868476	ND0656367974	ND0651868505	ND0656768601
Festuca vivipara					5	
Holcus lanatus			2			
Juncus bulbosus	2					
Juncus conglomeratus				5		
Juncus squarrosus	4					3
Molinea caerulea				4		
Pedicularis palustre				2		
Potentilla erecta			5		4	
Hylocomium splendens				3		
Pseudoscleripodium purum				6		
Polytrichum commune	5	3			4	4
Sphagnum angustifolia		5			7	6
Sphagnum capillifolium	8	9	9	6	4	8

Quadrat	H10Q1	H10Q2	H10Q3	H10Q4
Grid reference	ND0682468989	ND0680468983	ND0680968983	ND0679368984
Nardus stricta			4	3
Narthecium ossifragum		4		
Pedicularis palustre	3			1
Polygala serpyllifolia	2	2	2	
Potentilla erecta		4	4	3
Trichophorum germanicum	3			
Cladonia ciliata			4	3
Hylochomium splendens	5	6	6	5
Racomitrium lanuginosum	5	6	6	4
Bare ground	3	3		4

Table A1.7. H10 quadrat data.

Quadrat	H10Q1	H10Q2	H10Q3	H10Q4
Grid reference	ND0682468989	ND0680468983	ND0680968983	ND0679368984
Agrostis canina	3	2	3	
Anthoxanthum odoratum	4	5	5	3
Calluna vulgaris	8	8	8	6
Carex binervis	4	3	3	3
Carex panicea	3	4	4	
Cladonia ciliata	2	4		
Erica cinerea	3	5	5	4
Euphrasia agg.	3	3	3	1
Festuca ovina		4	4	
Festuca vivipara		2	2	
Juncus squarrosus		4	4	5
Luzula multiflora		3	3	
Luzula multiflora ssp. *congesta*	2			2

Festuca ovina	4	3	
Festuca rubra			3
Holcus lanata		6	6
Juncus acutiflorus	8	7	9
Juncus effusus	5	7	4
Luzula multiflora	3		
Nardus stricta	4		
Potentilla erecta	4		4
Ranunculus flammula		1	2
Ranunculus repens		4	3
Rumex crispus	3		
Taraxicum agg.	3		
Trifolium repens		4	3
Rhytidiadelphus squarrosus	7		

Table A1.8. M23 quadrat data.

Quadrat	**M23Q1**	**M23Q2**	**M23Q3**
Grid reference	ND0672568861	ND0582768792	ND0581368869
Achillea ptarmica			3
Agrostis canina	3	3	4
Anthoxanthum odoratum		3	
Bellis perennis		3	
Calluna vulgaris	4		
Carex nigra	3		
Carex panicea	3		
Circium palustre		3	
Cynosurus cristatus			3
Deschampsia cespitosa	2		5
Equisetum arvense	2		
Erica tetralix	3		
Eriophorum angustifolium	3		

Quadrat	SSMQ1	SSMQ2	SSMQ3	SSMQ4	SSMQ5	SSMQ6	SSMQ7
Grid reference	ND0680268529	ND0661168511	ND0662868523	ND0659368496	ND0653868478	ND0682568810	ND0680368596
Descampsia flexuosa							5
Drosera rotundifolia	3	1		2			3
Eleocharis palustre					7		
Eleocharis quinqueflora		1	3	4			
Equisetum arvense						3	
Equisetum palustre	5					2	
Erica tetralix	5		3	2	4	5	
Eriophorum angustifolium	6			3			6
Euphrasia agg.	2					3	
Festuca ovina						4	
Festuca rubra						3	
Holcus lanatus						5	
Hypericum pulchrum						3	
Hypericum perforata							

Table A1.9. Small Sedge Mire quadrat data.

Quadrat	SSMQ1	SSMQ2	SSMQ3	SSMQ4	SSMQ5	SSMQ6	SSMQ7
Grid reference	ND0680268529	ND0661168511	ND0662868523	ND0659368496	ND0653868478	ND0682568810	ND0680368596
Anthoxanthum odoratum	5					6	
Calluna vulgaris				3	3	6	
Carex binervis	5						
Carex dioica	2		3	2		1	3
Carex echinata	3		3				
Carex hostiana		5					
Carex lepidocarpa		5		4		1	8
Carex nigra				5			4
Carex panicea	5	7	5	8	5	6	
Carex pulicharis				3		4	
Carex viridula		7	5	4	5		
Circium palustre						3	
Dactylorhiza maculata							

Quadrat	SSMQ1	SSMQ2	SSMQ3	SSMQ4	SSMQ5	SSMQ6	SSMQ7
Grid reference	ND0680268529	ND0661168511	ND0662868523	ND0659368496	ND0653868478	ND0682568810	ND0680368596
Ranunculus flammula	3				1		
Schoenus nigricans					5		
Selaginella selaginoides							
Succisa pratensis	4			2	3	3	
Taraxacum agg.						3	
Trifolium repens						3	
Pseudoscleripodium purum	4						
Pleurozium schreberi							
Polytrichum commune					6		
Campylum stellatum							3
Hylocomium splendens						4	
Rhytidiadelphus loreus							
Rhytidiadelphus squarrosus					3		

Quadrat	SSMQ1	SSMQ2	SSMQ3	SSMQ4	SSMQ5	SSMQ6	SSMQ7
Grid reference	ND0680268529	ND0661168511	ND0662868523	ND0659368496	ND0653868478	ND0682568810	ND0680368596
Juncus acutiflorus							
Juncus articulatus	4					3	
Juncus bulbosus				2	2		
Luzula multiflora						2	
Luzula multiflora ssp. *congesta*						3	
Molinea caerulea	4			3			
Nardus stricta	5					6	3
Narthecium ossifragum	5			6			
Pedicularis palustre							
Pedicularis sylvatica	3			2	3		
Pinguicula vulgaris				3		3	
Potamogeton polygonifolius		5		4	4		
Potentilla erecta				3	4	4	
Prunella vulgaris						3	

Table A1.10. *Carex nigra* Mire quadrat data.

Quadrat	**CnQ1**	**CnQ2**	**CnQ3**
Grid reference	ND0675268482	ND0685168975	ND0691668872
Agrostis canina	3	2	3
Calluna vulgaris	5	4	2
Carex nigra	9	9	8
Drosera rotundifolia		3	
Empetrum nigrum ssp. *hermaphroditum*	5		
Erica tetralix	4	4	3
Eriophorum angustifolium	4		3
Juncus squarrosus			3
Luzula multiflora ssp. *congesta*	3		2
Narthecium ossifragum			3
Potentilla erecta	4		
Polytrichum commune	7		

Quadrat	**SSMQ1**	**SSMQ2**	**SSMQ3**	**SSMQ4**	**SSMQ5**	**SSMQ6**	**SSMQ7**
Grid reference	ND0680268529	ND0661168511	ND0662868523	ND0659368496	ND0653868478	ND0682568810	ND0680368596
Scorpidium revolvens		4		4	4		
Sphagnum angustifolia		6					
Sphagnum capillifolium	8						3
Sphagnum subnitens				3			
Sphagnum fallax	4						
Sphagnum papillosum	5						
Bare ground				5	5		
Open water							4

Table A1.11. U5c quadrat data.

Quadrat	U5cQ1	U5cQ2	U5cQ3	U5cQ4	U5cQ5	U5cQ6	U5cQ7	U5cQ8	U5cQ9	U5cQ10	U5cQ11	U5cQ12
Grid reference	ND0687268732	ND0633369125	ND0618068281	ND0606568447	ND0597568591	ND0630369239	ND0645568697	ND0656668869	ND0656968080	ND0618068281	ND0597568591	ND0687268732
Achillea millefolium					2							
Achillea ptarmica									3		2	
Agrostis capillaris			6		4	5		4	5	6	4	
Anthoxanthum odoratum	8	7	6	5		5	7	5	5	6		8
Bellis perennis	3											3
Calluna vulgaris	4			4			5		5			4
Cardamine pratensis		3										
Carex binervis		3				3	4					
Carex echinata				3								
Carex nigra	4	3		5			3					4
Carex panicea		3		5	3		5				3	
Carex pulicharis	3			3	3						3	3
Cerastium fontanum			2		3	4				2	3	

Quadrat	CnQ1	CnQ2	CnQ3
Grid reference	ND0675268482	ND0685168975	ND0691668872
Sphagnum capillifolium	9		
Sphagnum denticulatum	4	4	
Sphagnum fallax			9
Sphagnum fuscum			4
Sphagnum papillosum		3	
Sphagnum subsecundum		6	
Open water		4	

Quadrat	U5cQ1	U5cQ2	U5cQ3	U5cQ4	U5cQ5	U5cQ6	U5cQ7	U5cQ8	U5cQ9	U5cQ10	U5cQ11	U5cQ12
Grid reference	ND0687268732	ND0633369125	ND0618068281	ND0606568447	ND0597568591	ND0630369239	ND0645568697	ND0656668869	ND0656968080	ND0618068281	ND0597568591	ND0687268732
Juncus effusus				3	5		5		6			
Juncus squarrosus		4	3			4		3		3		
Lineum cathartica	3											3
Lolium perenne						3						
Lotus corniculatus	3											3
Luzula multiflora	3	2	2				2	1	1	2		3
Luzula multiflora ssp. *congesta*	3	3	3		2	3	3	2	2	3	1	3
Nardus stricta	4	5	7	6	6	6	5	9	4	7	6	4
Plantago lanceolata	1			2	3						3	1
Poa trivialis	3							3				3
Polygala serpyllifolia	1											1
Potentilla erecta	3	3	4	2	3	4	4	4	5	4	3	3
Ranunculus acris			3		3					3	3	
Ranunculus flammula				2								

Quadrat	U5cQ1	U5cQ2	U5cQ3	U5cQ4	U5cQ5	U5cQ6	U5cQ7	U5cQ8	U5cQ9	U5cQ10	U5cQ11	U5cQ12
Grid reference	ND0687268732	ND0633369125	ND0618068281	ND0606568447	ND0597568591	ND0630369239	ND0645568697	ND0656668869	ND0656968080	ND0618068281	ND0597568591	ND0687268732
Circium palustre					3		3				3	
Cynosurus cristatus				1	3						3	
Danthonia decumbens		4				4		3				
Deschampsia cespitosa				1	5		3		5		5	
Epilobium palustre							1					
Erica tetralix	1						2		3			1
Eriophorum angustifolium							3					
Euphrasia agg.	2										3	2
Festuca ovina		3				5	6	5				
Festuca rubra	2								3			2
Festuca vivipara	4											4
Galium saxatile	3					4		5				3
Holcus lanatus	3	7	7	7	8	7	5	5	8	7	8	3
Hypericum perforata	1											1

Table A1.12. U4b quadrat data.

Quadrat	U4bQ1	U4bQ2	U4bQ3	U4bQ4	U4bQ5	U4bQ6
Grid reference	ND0621068962	ND0615268946	ND0630568606	ND0623968969	ND0644867915	ND0593168704
Achillea millefolium	4	2				
Achillea ptarmica					2	
Agrostis canina	1		2			
Agrostis capillaris	7	7	7	7	3	5
Anthoxanthum odoratum	7	4	6	5		5
Bellis perennis						3
Calluna vulgaris	4	3	3	7	3	
Carex binervis		1	3			
Carex echinata				5	3	
Carex nigra			3			
Carex pulicharis						1
Cerastium fontanum			3			3
Circium palustre			2		3	2

Quadrat	U5cQ1	U5cQ2	U5cQ3	U5cQ4	U5cQ5	U5cQ6	U5cQ7	U5cQ8	U5cQ9	U5cQ10	U5cQ11	U5cQ12
Grid reference	ND0687268732	ND0633369125	ND0618068281	ND0606568447	ND0597568591	ND0630369239	ND0645568697	ND0656668869	ND0656968080	ND0618068281	ND0597568591	ND0687268732
Ranunculus repens				3	4						4	
Rumex crispus									3			
Succisa pratensis		1		3			3					
Taraxacum agg		3	4		3	3	2		1	4		
Trifolium repens	4			3	3	3		4			3	4
Viola riviniana	3		2	3			2			2		3
Hylocomium splendens							6					
Hypnum jutlandicum				4	5						5	
Rhytidiadelphus squarrosus		9	9	8	7	8		8	6	9	7	
Bare ground								3				

Quadrat	U4bQ1	U4bQ2	U4bQ3	U4bQ4	U4bQ5	U4bQ6
Grid reference	ND0621068962	ND0615268946	ND0630568606	ND0623968969	ND0644867915	ND0593168704
Pedicularis sylvatica			3			
Plantago lanceolata		1				3
Potentilla erecta	4	3	3	4	5	4
Prunella vulgaris						1
Ranunculus repens						5
Salix repens					2	
Succisa pratensis			2			
Taraxacum agg.						3
Trifolium repens			3			6
Viola riviniana		2				
Hylocomium splendens			4			
Pleurozium schreberi	6			4		
Pseudoscleripodium purum		3	6		5	4

Quadrat	U4bQ1	U4bQ2	U4bQ3	U4bQ4	U4bQ5	U4bQ6
Grid reference	ND0621068962	ND0615268946	ND0630568606	ND0623968969	ND0644867915	ND0593168704
Cynosurus cristatus						8
Danthonia decumbens		1				1
Deschampsia cespitosa				2	5	2
Eriophorum angustifolium				3		
Erica tetralix					3	
Euphrasia agg.	1	3				4
Festuca ovina	3		4	4	4	
Festuca rubra	4	3	3	4	5	
Galium saxatile	3	4		4		
Holcus lanatus	7	9		5	7	5
Juncus acutiflorus					3	
Juncus effusus				4	6	
Juncus squarrosus		1	4			
Luzula multiflora	3		3	3		3

Quadrat	U4bQ1	U4bQ2	U4bQ3	U4bQ4	U4bQ5	U4bQ6
Grid reference	ND0621068962	ND0615268946	ND0630568606	ND0623968969	ND0644867915	ND0593168704
Rhytidiadelphus squarrosus	8		4	6		6

Table A1.13. Species list.

Achillea millefolium
Achillea ptarmica
Agrostis canina
Agrostis capillaris
Anthoxanthum odoratum
Bellis perennis
Callergionella cuspidatum
Calluna vulgaris
Campylum stellatum
Cardamine pratensis
Carex binervis
Carex dioica
Carex echinata
Carex flacca
Carex hostiana
Carex lepidocarpa
Carex nigra
Carex panicea
Carex pulicharis
Carex viridula
Cerastium fontanum
Circium palustre
Cladonia ciliata
Cladonia uncialis
Salix repens
Cynosurus cristatus
Dactylorhiza maculata
Danthonia decumbens
Deschampsia cespitosa
Deschampsia flexuosa
Drosera rotundifolia
Eleocharis palustris
Eleocharis quinqueflora
Empetrum nigrum ssp. *hermaphroditum*
Epilobium palustre
Equiseteum fluviatile
Equisetum arvense
Equisetum palustre
Erica cinerea
Erica tetralix
Eriophorum angustifolium
Eriophorum vaginatum
Euphrasia agg.
Festuca ovina
Festuca rubra
Festuca vivipara
Galium saxatile
Geum rivale
Holcus lanatus
Hylocomium splendens
Hypericum perforatum
Hypericum pulchrum
Hyperzia selago
Hypnum jutlandicum
Juncus acutiflorus
Juncus articulatus
Juncus bulbosus
Juncus conglomeratus
Juncus effusus
Juncus squarrosus
Lineum cathartica
Lolium perenne
Lotus corniculatus
Luzula multiflora
Luzula multiflora ssp. *congesta*
Menyanthes trifoliumta
Molinea caerulea
Nardus stricta
Narthecium ossifragum
Pedicularis palustre
Pedicularis sylvatica
Pinguicula vulgaris
Plantago lanceolata
Pleurozium schreberi
Poa trivialis
Polygala serpyllifolia
Polytrichum commune
Potamogeton polygonifolius
Potentilla anserina
Potentilla erecta
Potentilla palustre
Prunella vulgaris
Pseudoscleripodium purum
Racomitrium lanuginosum
Ranunculus acris
Ranunculus flammula
Ranunculus repens
Rhytidiadelphus loreus
Rhytidiadelphus squarrosus
Rumex crispus
Salix repens
Schoenus nigricans
Scorpidium revolvens
Scorpidium scorpioides
Selaginella selaginoides
Sphagnum angustifolia
Sphagnum capillifolium
Sphagnum denticulatum
Sphagnum fallax
Sphagnum fuscum
Sphagnum papillosum
Sphagnum subnitens
Sphagnum subsecundum
Succisa pratensis
Taraxacum agg.
Trichophorum germanicum
Trifolium repens
Ulex europeaus
Urtica dioica
Viola palustre
Viola riviniana

DAFOR samples

D = Dominant; A = Abundant; F = Frequent; O = Occasional: R = Rare

M17: *Calluna vulgaris* D; *Carex nigra* F; *Cladonia* sp. O; *Drosera rotundifolium* O; *Empetrum nigrum* R*; Eriophorum angustifolium* D; *E. Vaginatum* O; *Juncus squarrosus* F; *Narthesium ossifragum* F; *Sphagnum pulicharis* D.

Svar: Carex nigra O;Eleocharis palustre O; Epilobeum palustre R;Equisetum arvense F;Equisetum palustre F ; *Geum rivale* f; Juncus articulatus F; *Menyanthes trifoliata* O *Potentilla palustris* D.

Pond (27a & S9): *Carex rostrata* D; *Equisetum palustre* D; *Menyanthes trifoliata* O

APPENDIX 2: SNH Correspondence

From: Chris Cathrine [mailto:chris.cathrine@caledonianconservation.co.uk]

Sent: 01 April 2014 17:03

To: Ian Sargent

Cc: Eamonn Flood

Subject: Hill of Forss Wind Farm Ecology & Ornithology Consultation

Hi Ian,

As discussed, Caledonian Conservation Ltd has been commissioned to undertake ornithology and ecology surveys for the proposed Hill of Forss Wind Farm. There is not currently a site design, and the candidate turbine model is yet to be selected. The results of the ecology and ornithology surveys will inform the site design and turbine model, alongside other constraints. It is anticipated that turbines will have a tip height of up to 125m, and flight activity surveys have been designed to cover this range. However, no turbine model has yet been agreed with the client.

I have attached a document that sets out our proposed methods, and also highlights the known sensitivities that we are considering. The document also indicates the vantage point location and viewshed analysis for flight activity surveys. As the project is not yet in the public domain, I would appreciate it if you treat this as confidential. (Please refer to the Consultation Report CC0111/R2).

Bird survey work began in September 2012 and is ongoing. A potential sensitivity identified is wildfowl associated with Caithness Lochs SPA, and targeted survey effort has been undertaken to inform a robust assessment of effects on these receptors, including foraging goose surveys in the wider area alongside flight activity surveys. Ecology surveys and additional ornithology surveys are scheduled for 2014, as detailed in the document. Due to changes in SNH wind farm bird guidance, earlier work was designed with reference to 2010 guidance and work since September 2013 has been designed with reference to 2013 guidance.

Survey results to date (up to and including January 2014) for Greenland white-fronted geese, greylag geese and whooper swans have been included in the document to provide an indication of the flight and feeding patters we are observing. The main flight corridors appear to follow low lying land around the site, with relatively few flights actually crossing over the higher ground of the site itself.

I would greatly appreciate any feedback, suggestions or recommendations SNH may have and aim to seek agreement over the approach.

If you would like to discuss this in greater detail, please do not hesitate to contact me by any method.

I look forward to hearing from you in due course.

Kind regards,

Chris

Chris Cathrine BSc(Hons) MCIEEM FLS

Director

Caledonian Conservation Ltd

On 2 April 2014 10:43, Ian Sargent <Ian.Sargent@snh.gov.uk> wrote:

Hi Chris

Thank you for sending through the report and information. I have passed this case onto my colleague Sian Haddon, as I am going to be out of the office over the next few weeks, and this should speed up a response from us.

Just to let you know that as we are bound to the Freedom of Information (FOI) and Environmental Information Regulations (EIR), we cannot guarantee confidentiality should we receive a FOI/EIR request. If you want any more information on this, or if you are concerned that quantifiable harm would occur if the information was released then please let me know.

All the best,

Ian

Ian Sargent

Operations Officer, Caithness

From: Chris Cathrine [mailto:chris.cathrine@caledonianconservation.co.uk]

Sent: 03 April 2014 13:22

To: Ian Sargent

Cc: Sian Haddon

Subject: Re: Hill of Forss Wind Farm Ecology & Ornithology Consultation

Hi Ian,

Thanks for sending the document to an appropriate member of SNH staff, and for the information regarding FOI and EIR. I appreciate SNH must comply with FOI and EIR legislation where appropriate.

My client, RES UK & Ireland Ltd, have requested that I forward on the below response from their legal team:

"We appreciate that you have obligations in respect of FOI and EIR and that confidentiality cannot always be guaranteed. We would respectfully ask that SNH bear in mind that this is ongoing work and that we are still in the process of gathering data. As our interests (including interests in relation to confidential information) in the reports need to be balanced against the public interest in any proposed disclosure, please consider these carefully before making any such disclosure, and communicate with us in respect of any such request."

Just let me know if you require any further information, and thanks again for your help.

I look forward to hearing from Sian in due course.

Kind regards,

Chris

Chris Cathrine BSc(Hons) MCIEEM FLS

Director

Caledonian Conservation Ltd

From: Sian Haddon <Sian.Haddon@snh.gov.uk>

Date: 17 April 2014 at 13:12

Subject: RE: Hill of Forss Wind Farm Ecology & Ornithology Consultation

To: Chris Cathrine <chris.cathrine@caledonianconservation.co.uk>

Dear Mr Catherine,

Hill of Forss Wind Farm – Ecology and Ornithology Consultation

Thank you for your e-mail, dated 1 April 2014, regarding the ecological and ornithological surveys for the above proposal. I am currently going through the report and thought it best to highlight a couple of points regarding the proposed bat surveys:

a) Section 3.3.3 of the report states that these surveys will be carried out May – September 2014. This does not appear to be in-line with BCT guidelines (2nd edition) which outlines that surveys should be carried out April – October. Therefore, we recommend that this period is extended to include this month (April) and October in order to fully assess the level of bat activity at this site. As we are currently part of the way through April, I thought it best to quickly e-mail you now to allow some time for surveys to be conducted this month.

b) In addition, it would be useful to clarify the level of survey effort selected for the bat surveys, prior to the surveys being carried out. Specifically, it would be useful to clarify whether a low risk or medium risk level has been selected in this case. We advise that the level of survey effort should be either one or the other (low risk or medium risk), rather than a mix of elements from both levels. However, we further advise that you should allow for flexibility, so that if unexpected results are recorded within the early part of the survey work, then the survey effort can be adjusted accordingly. For example, if a higher risk species or more survey activity is recorded, then this is likely to require an increase in survey effort to the next level for the remaining part of the season (as touched on in section 3.3.3.4 of your report). Further information is outlined in section 10.6 of the BCT guidelines (2nd edition).

I am aiming to have our full comments on the report completed for you before the 29 April 2014. In the meantime, if you have any questions or require any further information in relation to this proposal, please do not hesitate to contact me. Please note that our comments are given 'without prejudice' to the views which we may wish to express at a later stage in response to a formal consultation as part of the EIA or planning process.

Kind regards,

Sian

Siân Haddon

Operations Officer, Caithness

Scottish Natural Heritage | The Links | Golspie Business Park | Golspie | Sutherland | KW10 6UB

From: Chris Cathrine <chris.cathrine@caledonianconservation.co.uk>

Date: 22 April 2014 at 10:25

Subject: Re: Hill of Forss Wind Farm Ecology & Ornithology Consultation

To: Sian Haddon <Sian.Haddon@snh.gov.uk>

Hi Sian,

Thanks very much for getting back to me so quickly with those time critical queries - I really appreciate it.

I have prepared the following with my associate, Stuart Spray (the bat expert who designed the approach), which I hope clarifies the methods, and explains why we believe the proposed approach is appropriate to this site in our professional judgement.

The methodology for all bat surveys on wind farm sites is prepared using a combination of local knowledge, professional judgement (i.e experience of undertaking bat surveys and personal knowledge of bat ecology) and current guidance (as indicated in the consultation documet). It is important that the approach to surveys reflects the specific circumstances of the site being surveyed, and that these are designed to reflect this. To clarify, in this case we have assessed Hill of Forss to be a low risk site, although we would revised our approach as appropriate should the desk study or our survey results indicate that there are greater bat sensitivities such as Nathusius' pipistrelle, as indicated in the consultation document. However, it should be noted that the survey conducted as part of the National Bat Wind Farm Survey in 2011 at the nearby operational Forss Wind Farm site did not find Nathusius' pipistrelles to be present. Therefore our approach is designed to address the site as low risk, but takes a precautionary approach so as to allow the detection of greater bat sensitivities in the unlikely event that they are present. More detail is provided below on your specific queries.

a) Section 3.3.3 of the report states that these surveys will be carried out May – September 2014. This does not appear to be in-line with BCT guidelines (2nd edition) which outlines that surveys should be carried out April – October. Therefore, we recommend that this period is extended to include this month (April) and October in order to fully assess the level of bat activity at this site. As we are currently part of the way through April, I thought it best to quickly e-mail you now to allow some time for surveys to be conducted this month.

- BCT guidance recommends one transect per season (spring, summer and autumn) for low risk sites. Experience has shown that there is little or no bat activity in April and October in the north of Scotland. As a result May, July and September have been chosen as the preferred survey months, as they maximize the chance of detection of bats if present (whereas if visits were completed in April and October we may not detect bats due to low or no activity in these months, even if they are present). May and September also correspond to the preferred months recommended by BCT for recording migrating bats, which may be at risk of collision with wind turbines. This also targets the period when Nathusius' pipistrelles would pass through the area if the site does lie on a migration route, and so would maximize the chance of us detecting this sensitivity if present.

b) In addition, it would be useful to clarify the level of survey effort selected for the bat surveys, prior to the surveys being carried out. Specifically, it would be useful to clarify whether a low risk or medium risk level has been selected in this case. We advise that the level of survey effort should be either one or the other (low risk or

medium risk), rather than a mix of elements from both levels. However, we further advise that you should allow for flexibility, so that if unexpected results are recorded within the early part of the survey work, then the survey effort can be adjusted accordingly. For example, if a higher risk species or more survey activity is recorded, then this is likely to require an increase in survey effort to the next level for the remaining part of the season (as touched on in section 3.3.3.4 of your report). Further information is outlined in section 10.6 of the BCT guidelines (2ndedition).

We have assessed the proposed Hill of Forss wind farm as being of low risk to bats and designed the survey approach to reflect specific site circumstances, for the following reasons:

- Due to its northerly location, the proposed site is unlikely to affect high flying, high risk bat species such as noctule or Leisler's which are known to be present in central and southern Scotland but not in the far north of Scotland. Species likely to be recorded if bats are present at this site include medium risk species such as common and soprano pipistrelle bats and low risk species including Natterer's and Daubenton's bats. In addition, a survey conducted as part of the National Bat Wind Farm Survey in 2011 at the nearby Forss Wind Farm only recorded common pipistrelle, soprano pipistrelle, brown long-eared and Myotis bats (which will either be Daubenton's or Nattere's bats, both of which are low risk species) supporting the preliminary assessment that the proposed Hill of Forss Wind Farm is unlikely to affect any high risk species of bats.

- Recent records of Nathusius' pipistrelle bats recorded on North Sea oil rigs, on Shetland and Orkney and along the eastern coast of Scotland and north eastern-England in September strongly suggest that this species may be migratory. Although there are no known local records for this species, it is possible that Nathusius, a high risk bat species, could be present at a certain time of the year and we believe it is important that the survey design for Hill of Forss maximizes the chance of us detecting this sensitivity if present. Transects and remote bat detector surveys have, therefore, been timed to take place in September (and May which is another potential migration month), to coincide with a time of year when Nathusius' pipistrelle bats may have started migrating and when most of the records for this species have been recorded elsewhere. It should be noted that Nathusius' pipistrelle was not detected during the National Bat Wind Farm Survey in September 2011.

- Roosting opportunities are limited with no trees and just handful of farm buildings.

- The site is extremely exposed and offers poor quality foraging habitat that is not connected to the wider landscape by linear features such as scrub, tree lines or steams. Although there is pond located in the middle of the site, the connectivity to the wider landscape remains poor.

I hope the above information clarifies our approach, although would reiterate that we will adjust our survey methods should the desk study or novel fieldwork reveal any additional sensitivities. Our precautionary survey approach has been specifically designed to ensure the chance of detecting potential sensitivities is as likely as possible.

We are keen to seek agreement with SNH on this approach, and I would be pleased to provided further information or discuss the project in greater detail if this would be helpful. Please do not hesitate to contact me by any method, and I will respond as quickly as I am able.

From: Sian Haddon <Sian.Haddon@snh.gov.uk>

Date: 29 April 2014 at 16:53

Subject: RE: Hill of Forss Wind Farm Ecology & Ornithology Consultation

To: Chris Cathrine <chris.cathrine@caledonianconservation.co.uk>

Hi Chris,

Hill of Forss Wind Farm – Ecology and Ornithology Consultation

Thank you for your e-mail, dated 22 April 2014, clarifying the level of survey effort selected for the proposed bat surveys. I apologise for not getting back to you sooner, as I have been out of the office over the past couple of days. Please find attached our pre-application comments on the above proposal. We have included our advice on the proposed bat surveys within this response (section 3.1 of the attached letter).

Please let me know if you require any further information or advice in relation to this proposal.

Kind regards,

Sian

Siân Haddon

Operations Officer, Caithness

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

BY EMAIL
Chris Cathrine
Director
Caledonian Conservation Ltd.
chris.cathrine@caledonianconservation.co.uk

29 April 2014
Our ref: CPA130112
Your ref: CC0111/R2

Dear Mr Cathrine,

Hill of Forss wind farm – pre-application comments on ecology and ornithology surveys

Thank you for your e-mail, dated 1 April 2014, requesting pre-application comments on the ecology and ornithology surveys carried out for the above proposal.

We would like to highlight our general scoping and pre-application advice[1], which outlines some recommended guidance and sources of information that will be relevant when considering a wind farm development. In addition there is a host of information and guidance for onshore wind developments available on our website including topics such as landscape, birds and protected species (http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/).

1. Summary
We are broadly in agreement with the completed and proposed survey methods for this proposal. The main sensitivities of the site have been identified and the proposed/completed surveys appear to be appropriate for the site. We include specific advice below in relation to protected areas, bats and landscape.

2. Comments on completed/proposed ornithological surveys
We are aware that our bird survey guidance was updated during the course of this survey work (August 2013). Based on the information provided, the completed/proposed bird survey work appears to follow our guidance. We are pleased to see that both sets of guidance have been used to inform different years of survey work.

However, we cannot comment on the suitability of the duration of each Vantage Point (VP) survey or their spread throughout the breeding and non-breeding season as this information has not been provided.

2.1 Caithness Lochs Special Protection Area (SPA)
The proposal lies approximately 5.7km from this SPA, which is classified for its wintering populations of Greenland white-fronted geese, (Icelandic) greylag geese and whooper swans[2].

[1] Available at: http://www.snh.gov.uk/docs/A1150291.pdf
[2] Further information on the site's qualifying features and conservation objectives can be found through our SiteLink service at: http://www.snh.gov.uk/publications-data-and-research/snhi-information-service/sitelink/

The Links, Golspie Business Park, Golspie, Sutherland KW10 6UB
Tel 01408 634063 Fax 01408 634222 www.snh.org.uk

An Ceangal, Roan Gniomhachais Ghoillspidh, Goillspidh, Cataibh, KW10 6UB
Fòn 01408 634063 Fax 01408 634222 www.snh.org.uk

The proposal lies close to known favoured feeding fields for Greenland white-fronted geese. From the information provided, this species has not been recorded feeding in close proximity to the proposal site. However, this species is site-faithful and they are likely to return to favoured feeding fields during the lifetime of the development. Therefore, we advise that the design of the development site should aim to avoid impacts on fields known to be regularly used by Greenland white-fronted geese (and other species connected with the SPA).

Information on the location of these fields is included in the Greenland white-fronted goose study's small wintering sites report[3]. Page 64 of this report is specific to the Westfield area, close to the proposal site. In addition, more information on the feeding regime of geese and swans in Caithness is available in our commissioned report on the Caithness Lochs SPA[4].

In relation to this SPA, the completed and proposed survey work appears to follow our bird survey guidance. We note that only 4 hours of VP survey work was completed during the 2013 spring migration period. Although this is less than our recommended survey effort, we note that 36 hours of VP survey will be completed during the 2014 spring migration period. Given the change in our bird survey guidance and that 1 full year of wintering and migratory period (autumn and spring) will have been covered this year, we are happy to accept 1 years' worth of spring migration survey effort in this case. The report states that goose flights have remained fairly similar between both years of survey despite different weather conditions. We encourage you to refer to the above reports to confirm that the flights are representative of the usual pattern of activity. Please note that for other developments, 2 years' worth of survey effort over the wintering and migratory periods (autumn and spring) would be required as outlined in our 2013 bird survey guidance.

Due to the introduction of foraging goose surveys in our 2013 guidance, we are happy to accept 1 years' worth of foraging goose survey effort. We note that the wintering bird surveys (carried out in 2012/13) recorded no geese or swan foraging within the proposal site. Again, we would encourage you to refer to the above reports when making an assessment of the likely impacts of disturbance and displacement from the proposal.

2.2 North Caithness Cliffs SPA
The proposal site lies approximately 1.5km from this SPA, which is classified for its cliff nesting seabirds and population of peregrine falcon. We note that Table 1 of the report states that species from this SPA are unlikely to fly inland. However, the proposal site lies within core foraging range for peregrine falcon, which can fly inland to hunt. Due to this connectivity, an assessment of the likely impacts on this SPA will be required. Therefore, it would be useful to clarify whether this species has been included as a target species within the completed and proposed survey work.

2.3 Further Assessment
Following completion of VP survey work, Collision Risk Modelling[5] should be undertaken (where appropriate) and an assessment should be made against the conservation objectives for the above SPAs[1]. In relation to bird populations from the wider countryside, an assessment should be made against the relative Natural Heritage Zone (NHZ). In this case the relevant zone would be NHZ 2: Orkney and Northern Caithness and further information can be found at http://www.snh.gov.uk/docs/A306319.pdf and http://www.snh.gov.uk/docs/A306318.pdf (2009 update).

[3] Full report is available from: http://greenlandwhitefront.org/publications/small-sites-report/
[4] Available from: http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=2054
[5] Further information on Collision Risk Modelling can be found on our website at: http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/bird-collision-risks-guidance/.

Given the number of proposals and built wind farms in the area, a cumulative assessment for birds will be very important. We refer you to Section 4 of our cumulative guidance[6] which is specific to cumulative assessment on birds. In addition, where a collision risk is identified, we would be happy to advise you on the appropriate development and figures to include in a cumulative collision risk assessment.

2.4 Meteorological met mast

We also note that the proposed development is likely to include the installation of a meteorological met mast. If this is likely to be a guyed met mast, it could pose a collision risk to birds flying through the proposal site. Therefore, we recommend that the guy wires are appropriately marked with bird deflectors in order to increase the visibility of these wires. These deflectors should be regularly maintained to ensure they remain in place throughout the lifetime of the development. Please refer to our recently published guidance on guyed meteorological masts for further information[7].

3. Comments on completed/proposed ecological surveys (non-avian)

We note that surveys for protected species (otter, wildcat, water vole, pine marten and badger) and habitats are proposed to take place this year (2014). From the information provided, these surveys appear to follow recognised methodologies. More information on protected species/habitats and the protection afforded to them is available from our website (http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/).

3.1 Bats

Thank you for clarifying the level of survey effort selected for this site in relation to bats (e-mail dated 22 April 2014). As a low risk level has been selected, we are happy to see that surveys are proposed during each season (spring, summer and autumn).

However, we would like to clarify that the remote static bat surveys should be carried out over 5 consecutive nights during each season (April – October) rather than 5 days as outlined in section 3.3.3.5 of the report. Also, it is not clear if the roost surveys will cover the proposal site and an appropriate buffer around it. Section 10.5.3 of the BCT guidelines (2nd edition) recommends that roost surveys for wind farm sites should extend to a 200m buffer around the proposal site.

We note that both the activity line transects and the remote static bat surveys will start 15 minutes before sunset, rather than 30 minutes as outlined in the BCT guidelines. We recognise the reasoning for this in terms of the walked transects. However, as the remote detectors will be automatically timed to start, we recommend that these surveys should start 30 minutes before sunset. Currently, we are unable to comment on the suitability of the location of the automated recorders or transects as this information has not been provided.

Depending on the results of the initial surveys, the suitability of the site for bats may need to be reviewed in accordance with BCT guidelines (2nd edition).

In relation to Natterer's bats (mentioned in your e-mail) we are unaware of any records of this species this far north. If this species is recorded within the surveys, this would be the most northerly record.

4. Landscape and Visual Impact Assessment (LVIA)

We would like to highlight at this stage that there may be landscape and visual impact issues at this site which would require careful consideration during the design and layout stage of the proposal. Therefore, we would be grateful if you could pass this information onto the developer.

[6] Available at: http://www.snh.gov.uk/docs/A675503.pdf
[7] Available at: http://www.snh.gov.uk/docs/A1240025.pdf

We recommend that the developer refers to our scoping response of May 2013 for a development near Tresdale Farm, Canisbay. This proposal is located in a similar coastal location and our response outlines what is likely to be required in terms of a landscape assessment. This response is publically available online via the Highland Council's e-planning website (http://wam.highland.gov.uk/wam/) using the planning reference 13/01473/SCOP. However, we also strongly recommend that the developer seeks pre-application advice from the Highland Council regarding landscape and visual impacts.

5. Service Level Statement (SLS)

Our SLS[8] sets out the level of engagement you may expect from us during the planning process. In line with our SLS, where the impacts on the natural heritage warrant further input, we would be happy to provide further advice prior to the submission of the planning application.

Please note that while SNH is supporting of the principle of renewable energy, our advice is given without prejudice to a full and detailed consideration of the impacts of the proposal if submitted for formal consultation as part of the EIA or planning process.

Please let me know if you need any further information or advice from us in relation to this proposal.

Yours sincerely

Siân Haddon
Operations Officer, Caithness
Sian.Haddon@snh.gov.uk

[8] Available from: http://www.snh.gov.uk/planning-and-development/renewable-energy/our-approach-to-renewables/managing-applications/

From: Chris Cathrine <chris.cathrine@caledonianconservation.co.uk>

Date: 23 May 2014 at 13:31

Subject: Re: Hill of Forss Wind Farm Ecology & Ornithology Consultation

To: Sian Haddon <Sian.Haddon@snh.gov.uk>

Hi Sian,

Thanks for sending through the detailed response. We are pleased that SNH broadly support the approach to surveys at the site.

With regards to specific points within the document:

- 2.2 - I can confirm that peregrine, as well as all other Schedule 1 raptors, are always included as target species for flight activity surveys. We are also surveying for breeding peregrine during raptor surveys.

- 3.1 - We are happy to complete an assessment of bat roost potential for all buildings within 200m of potential turbine locations. Any building which is rated as having medium or high bat roost potential within 50m of potential turbine locations will then be subjected to emergence/re-entry surveys as described in the consultation document. 50m is the buffer recommended in Natural England guidance (2012). We will ensure remote bat detectors are timed to include 30m before sunset.

I hope the above addresses your queries, but please do not hesitate to contact me should you require further information or wish to discuss the project in greater detail. I would appreciate it if you could confirm that the approach is acceptable to SNH, with the above clarifications.

Kind regards,

Chris

Chris Cathrine BSc(Hons) MCIEEM FLS

Director

Caledonian Conservation Ltd

From: Chris Cathrine <chris.cathrine@caledonianconservation.co.uk>

23 May 2014 13:34

To: Sian Haddon

Subject: Re: Hill of Forss Wind Farm Ecology & Ornithology Consultation

Hi Sian,

Apologies, I forgot to ask if SNH would be able to share data regarding known peregrine nest locations historically at North Caithness Cliffs SPA (even if only Site Condition Monitoring data is available)? This would be very helpful for providing context for our assessment, but we will complete a second year of novel survey effort in 2014 regardless.

Kind regards,

Chris

Chris Cathrine BSc(Hons) MCIEEM FLS

Director

Caledonian Conservation Ltd

From: Sian Haddon <Sian.Haddon@snh.gov.uk>

Date: 2 June 2014 at 16:16

Subject: RE: Hill of Forss Wind Farm Ecology & Ornithology Consultation

To: Chris Cathrine <chris.cathrine@caledonianconservation.co.uk>

Hi Chris,

Apologies for the delay in replying to you. I'm just catching up with e-mails as I've been out of the office for a few days last week.

I can confirm that from the information provided, we are happy with your approach to the ecological and ornithological surveys proposed for the Forss Wind Farm. In terms of information regarding peregrine nest locations, I will need to check with an advisor what data we would be able to provide you with. I will let you know what I've heard back from them.

I also wanted to let you know that the information relating to the Forss 3 development, which you sent to my colleague Ian Sargent, has been passed onto me to reply. I am aiming to provide you with some comments by the 18 June 2014. Could you please let me know if this will be a problem?

Kind regards,

Sian

Siân Haddon

Operations Officer, Caithness

APPENDIX 3: Photographs

Photo 1. Example of scattered scrub in the north west of the site (ND0568268527) © Glenn Norris

Photo 2. Grazed and wind-clipped dry heath on thin soils near Raven's Hill (ND0670969133) © Glenn Norris.

Photo 3. Example of wet heath that dominates the south of the site (ND06686903) © Eamonn Flood

Photo 4. Example of acid flush with *Sphagnum* carpet and *Eriophorum angustifolium* (ND0655368610) © Glenn Norris

Photo 5. Swamp dominated by *Equisetum pratense* and *Carex rostrata* (ND0639768459) © Glenn Norris

Photo 6. Thin manmade channels that drain the site offer unsuitable habitat for otter and water vole (ND0632069180) © Eamonn Flood

Photo 7. Heavily trampled and recently burnt M15a Wet heath (ND06186870) © Eamonn Flood

Photo 8. Typical sub-community of M15b (ND06856880) © Eamonn Flood

Photo 9. Mvar *Eriophorum angustifolium* mire (ND06506855) © Eamonn Flood

Photo 10. Svar *Potentilla palustis* swamp Hill of Forss (ND06766864) © Eamonn Flood

Photo 11. Small sedge mire Hill of Forss (ND06806877) © Eamonn Flood

Photo 12. *Carex nigra* mire (ND06906890) © Eamonn Flood

Photo 13. View of scrub on southern boundary of the site © Stuart Spray

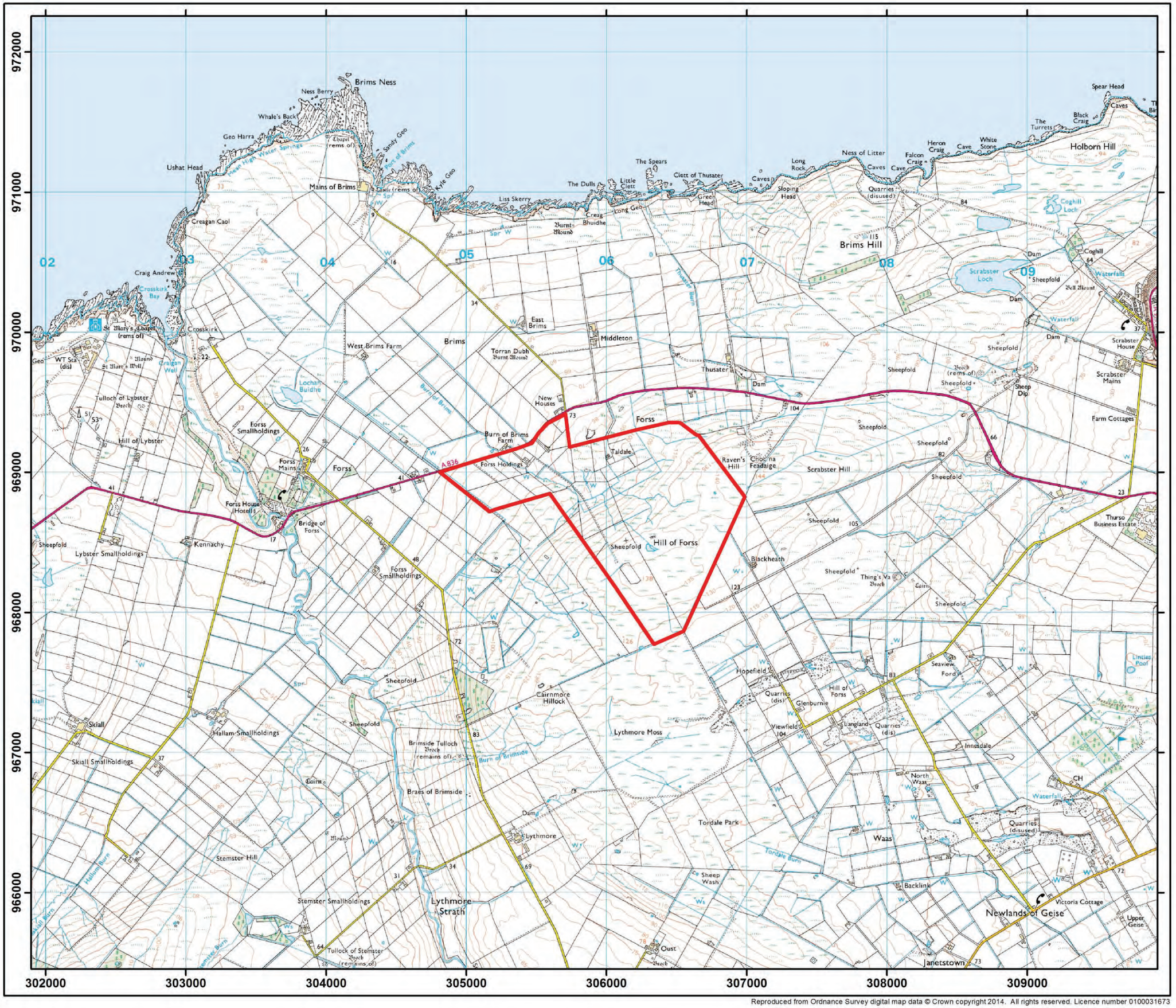
Photo 14. Main farm buildings, Hill of Forss © Stuart Spray

Photo 15. Example of buildings with 200m of the site boundary © Stuart Spray

Photo 16. Example of buildings with 200m of the site boundary © Stuart Spray

Photo 17. View of derelict building and surrounding improved fields (ND060691) © Stuart Spray

APPENDIX 4: Figures



res

Caledonian Conservation Ltd

Key

Site boundary

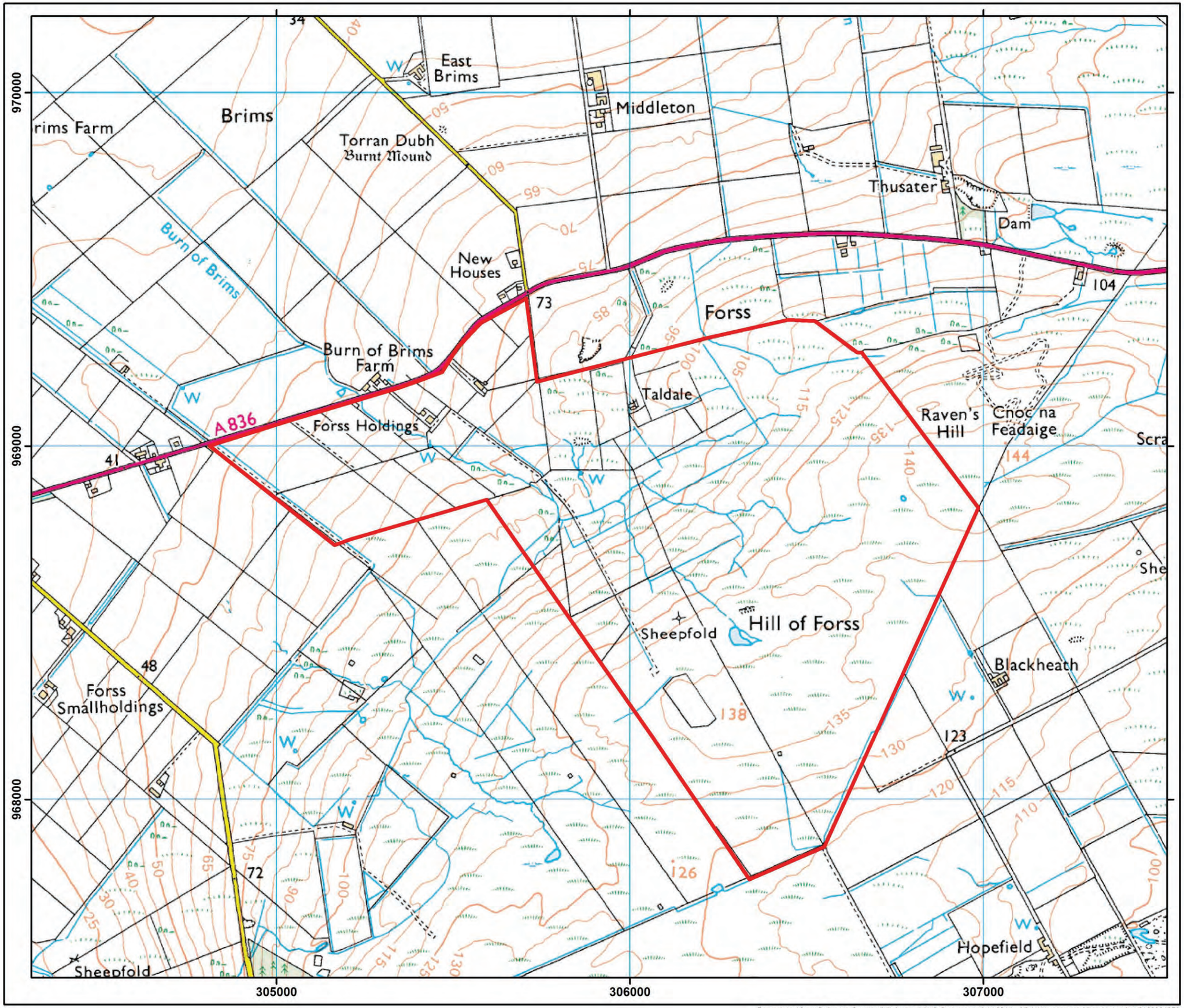
Scale 1:25,000 @ A3

0 250 500 1,000 m

N

Figure 1
Site Location

Hill of Forss
Ecology



res

Caledonian Conservation Ltd

Key

Site boundary

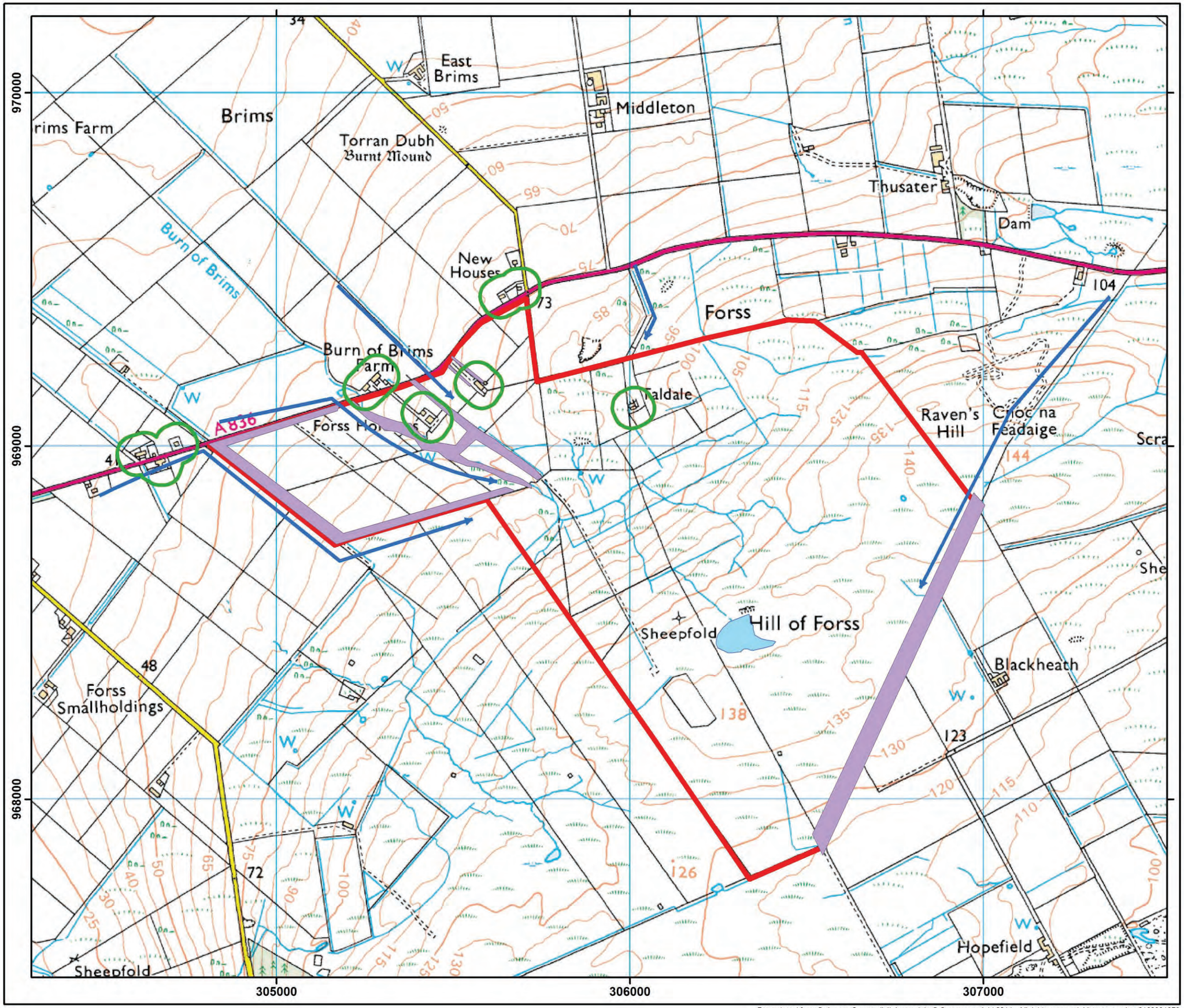
Scale 1:10,000 @ A3

0 100 200 400 m

N

Figure 2
Site Boundary

Hill of Forss
Ecology



res

Caledonian Conservation Ltd

Key

- Potential commuting route
- Habitat of high foraging value but low roosting value
- Waterbody
- 50m Exclusion zone of potential bat roosts
- Site boundary

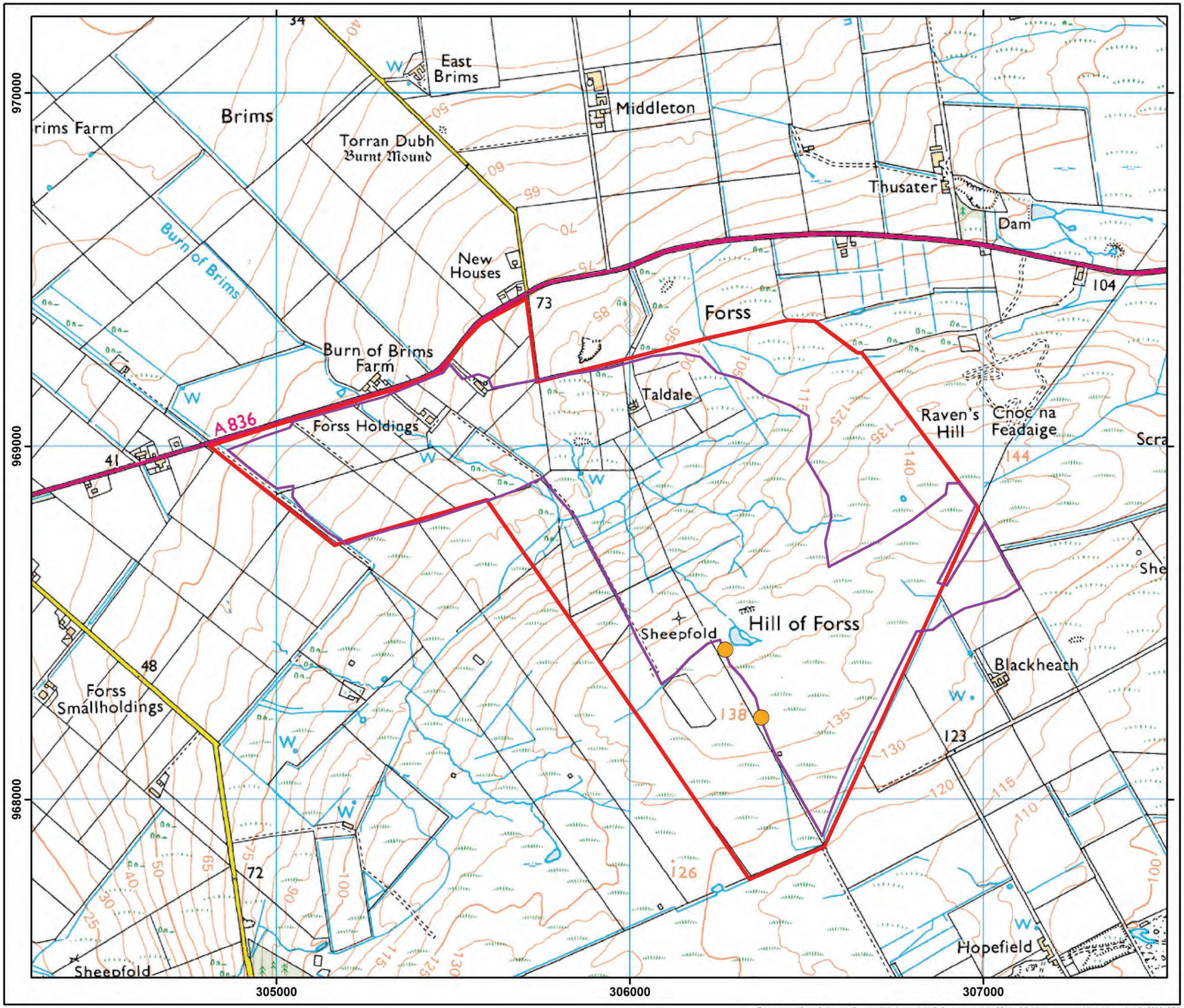
Scale 1:10,000 @ A3

0 100 200 400 m

N

Figure 3
Bat Habitat Assessment

Hill of Forss
Ecology



res

Caledonian Conservation Ltd

Key

- Remote detector locations
- Transect route
- Site boundary

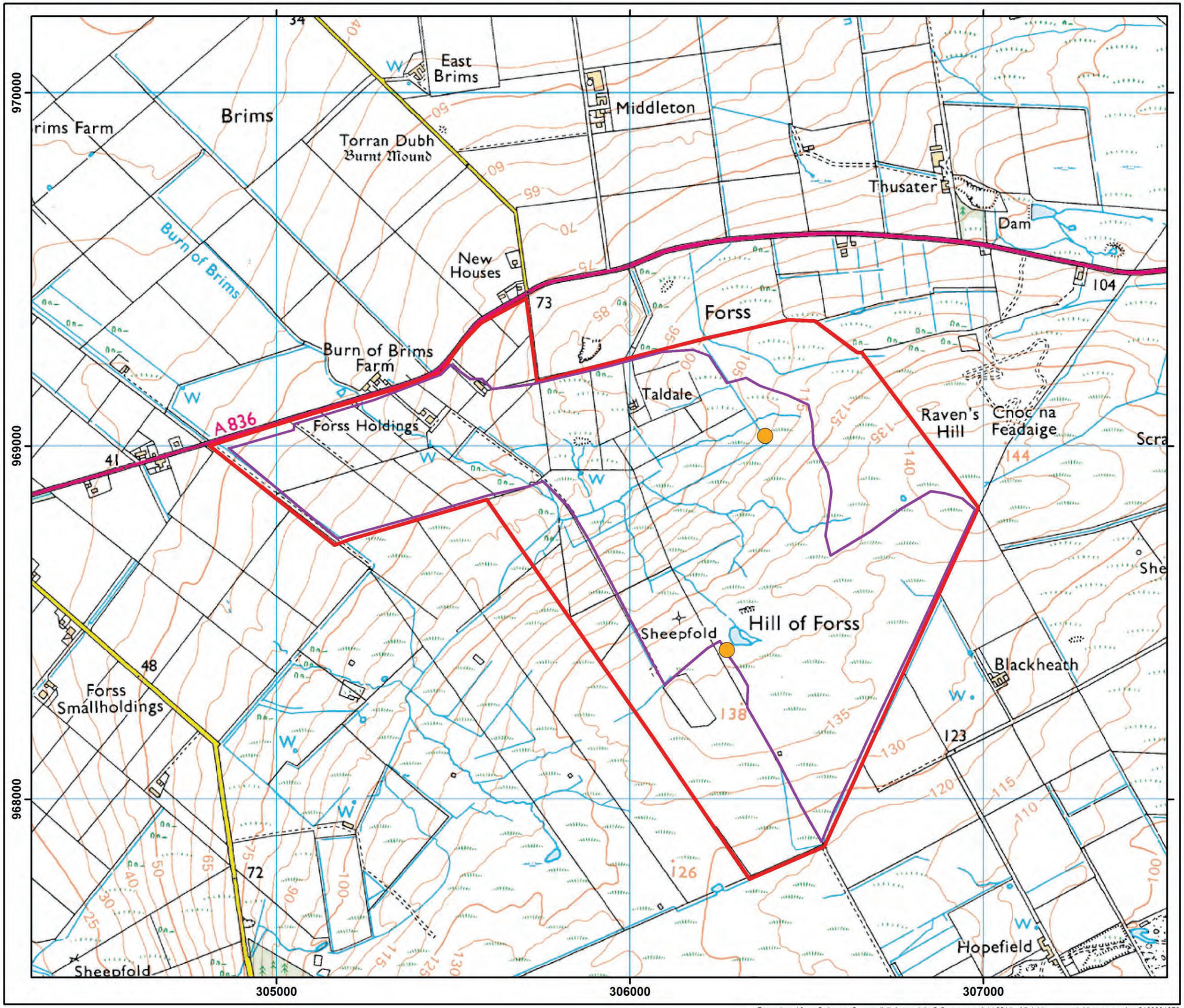
Scale 1:10,000 @ A3

0 100 200 400 m

N

Figure 4
Bat Surveys: May 2014

Hill of Forss
Ecology



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Caledonian Conservation Ltd

Key

- Remote detector locations
- Transect route
- Site boundary

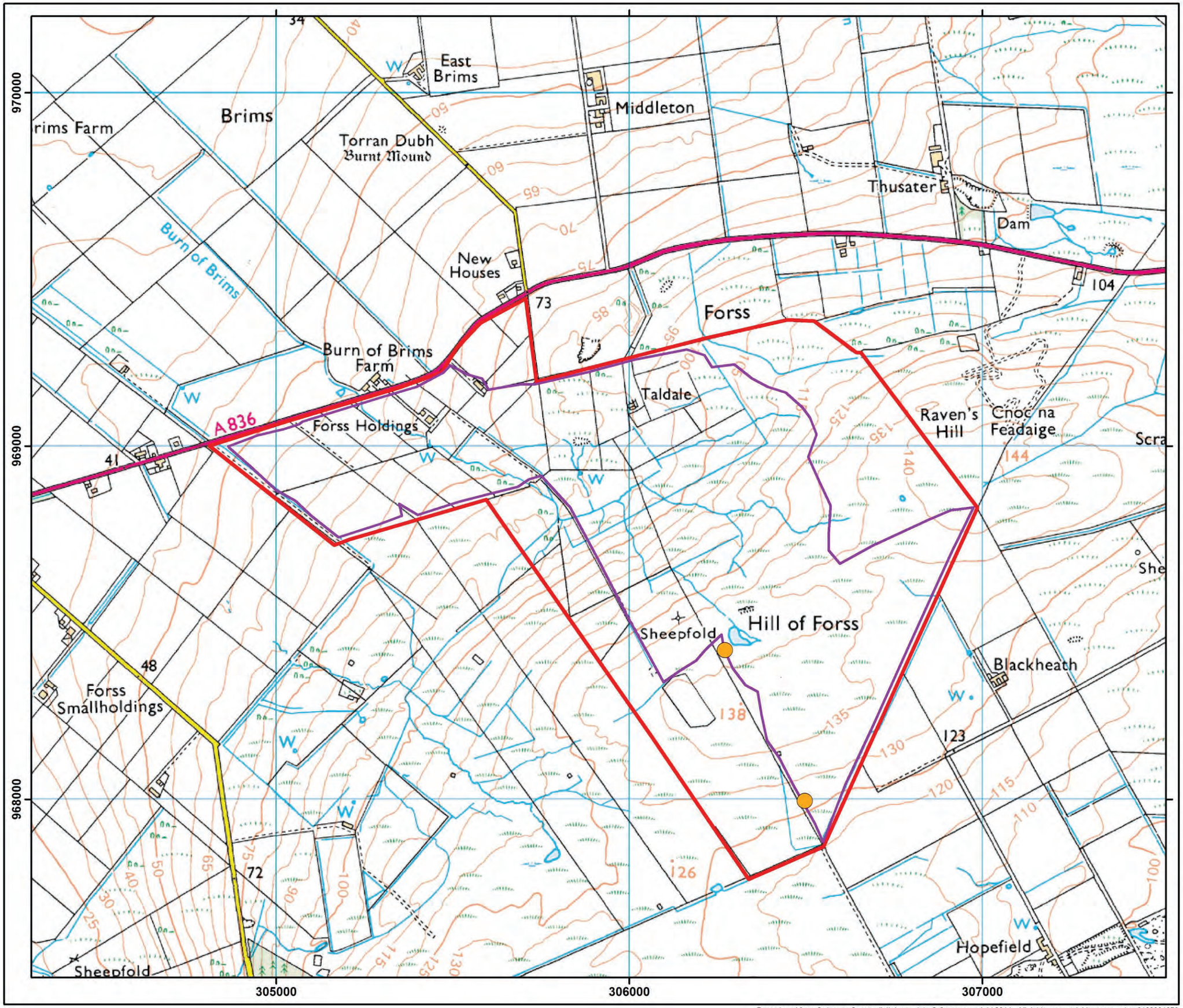
Scale 1:10,000 @ A3

0 100 200 400 m

N

Figure 5
Bat Surveys: July 2014

Hill of Forss
Ecology



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Caledonian Conservation Ltd

Key

- Remote detector locations
- Transect route
- Site boundary

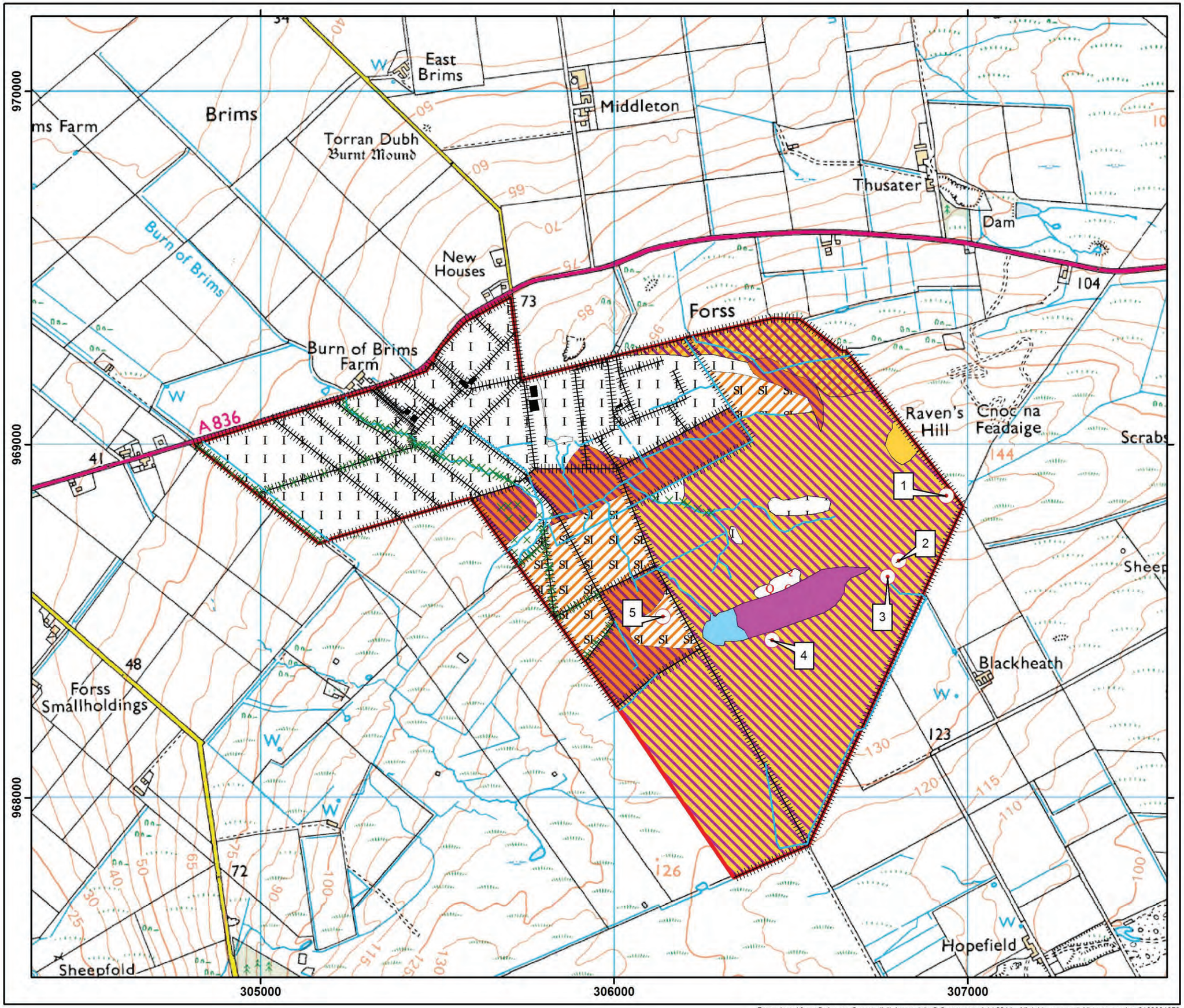
Scale 1:10,000 @ A3

0 100 200 400 m

N

Figure 6
Bat Surveys: September 2014

Hill of Forss
Ecology



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Caledonian Conservation Ltd

Key

- Target note
- A2.2 Scattered scrub
- G2 Running water
- J2.4 Fence
- A2.2 Scattered scrub
- B1.2 Semi-improved acid grassland
- B4 Improved grassland
- B5 Marsh/marshy grassland
- D1.1 Dry dwarf shrub heath
- D2 Wet dwarf shrub heath
- D6 Wet heath/acid grassland mosaic
- E2.1 Acid flush
- F1 Swamp
- I2.1 Quarry
- J3.6 Buildings
- J5 Other (track)
- Site boundary

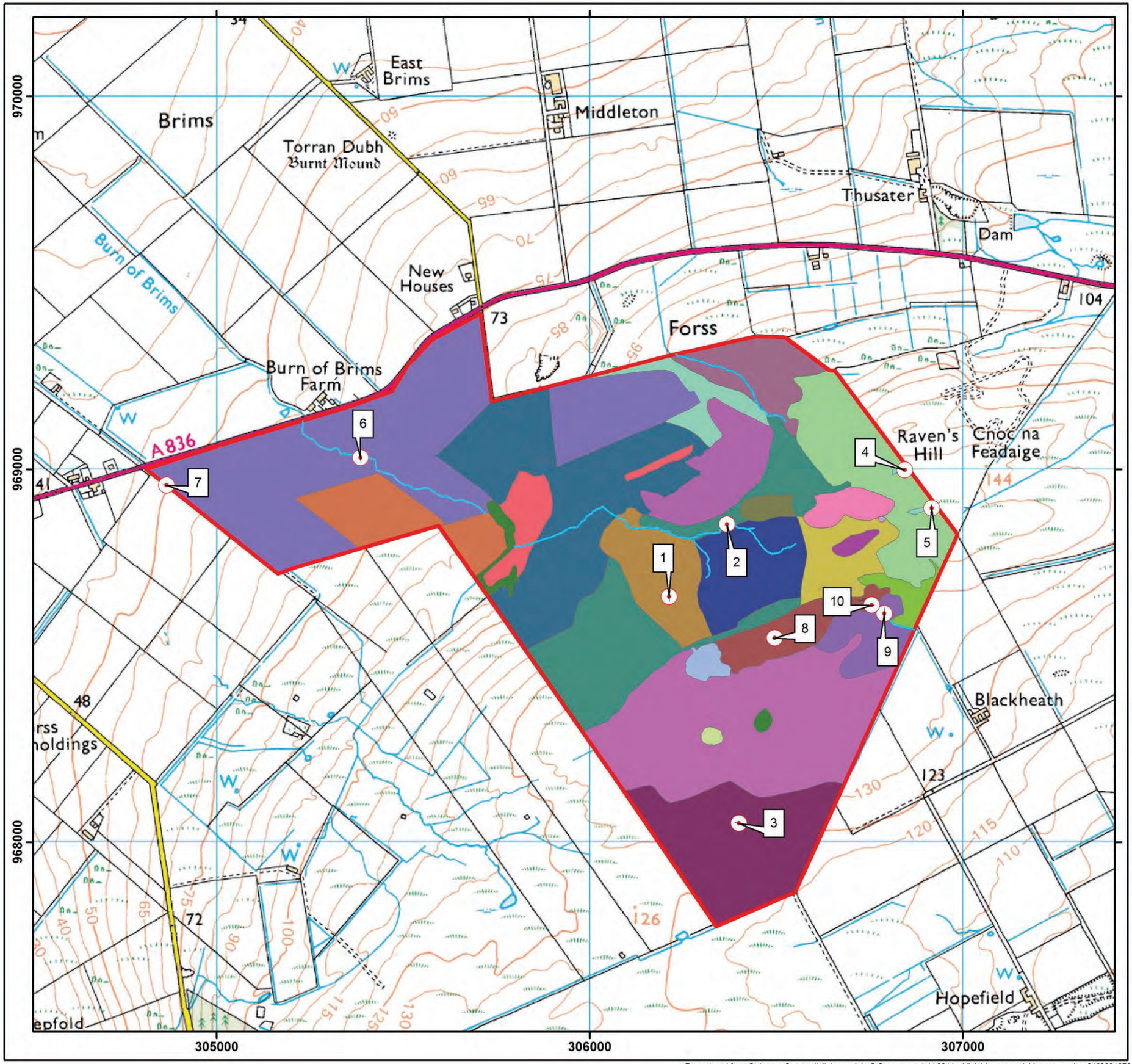
Scale 1:10,000 @ A3

0 100 200 400 m

N

Figure 7
Phase 1 Habitat Survey

Hill of Forss
Ecology



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Key

- Target note
- Watercourse
- Carex nigra mire
- M15a 40%, U4b 40%, U5c 20%
- M15a
- M15b 60%, M15a 40%
- M15a 40%, U5c 40%, M15b 10%, SSM 10%
- M15a (50%), SSM (50%)
- SSM 60%, M15a 40%
- M15a 50%, SSM 25%, M15b 20%, H10 5%
- M15a 50%, M15b 50%, (U4b) (U5c)
- M15b 80%, M15a 15%, H10 5%
- M15b 80%, M15a 20%
- M17
- MG10
- MG6
- Mvar
- S10
- S27 95%, S9 5%
- M15a 95%, SSM 5%
- Svar
- U4b
- U4b 50%, SSM 50%
- U5c
- M15a 40%, U5c 40%, M15b 20%
- U4b 80%, U5c 20%
- U5c 60%, U4b 40%, (MG6)
- W23
- Site boundary

Carex nigra mire (no NVC community)
SSM = Small sedge mire (no NVC community)
Mvar = Mire community (no NVC community)
Svar = Swamp community (no NVC community)

Scale 1:10,000 @ A3

0 100 200 400 m

N

Figure 8
National Vegetation Classification

Hill of Forss
Ecology

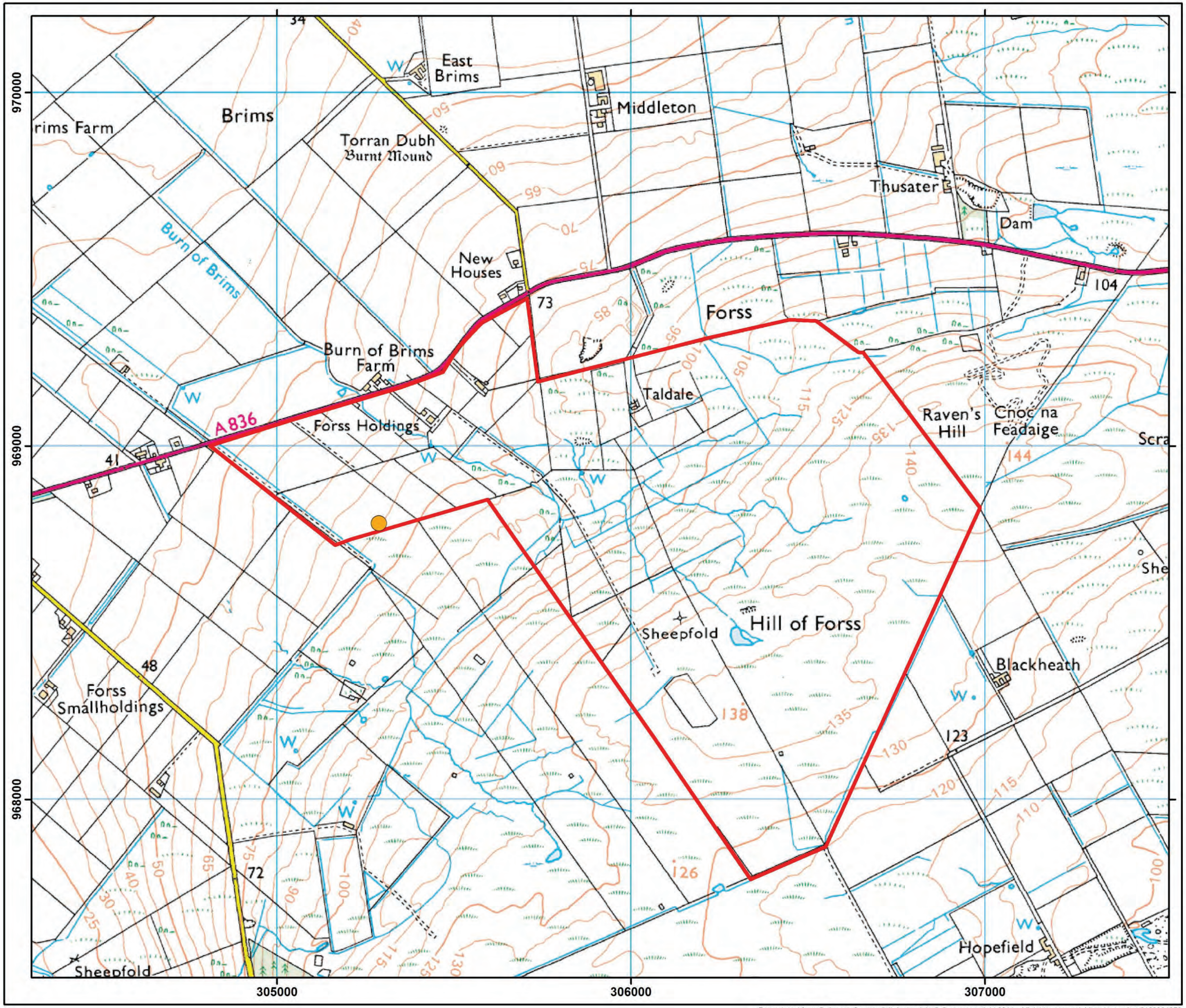
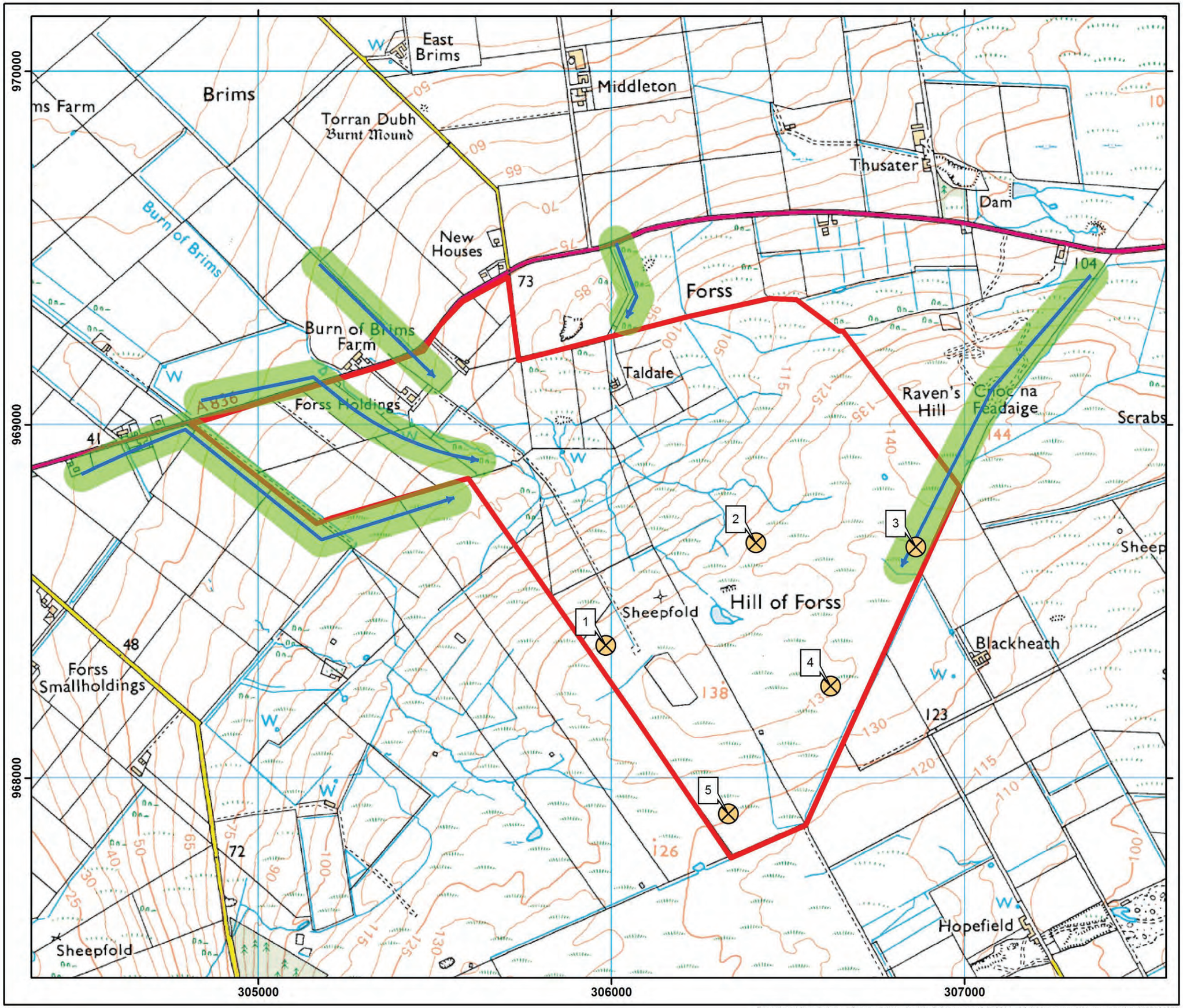


Figure 9
Bat Transect Results

Hill of Forss Ecology



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Caledonian Conservation Ltd

Key

- Indicative turbine
- Potential bat commuting route
- 50m buffer of potential bat commuting routes
- Site boundary

Scale 1:10,000 @ A3

0 100 200 400 m

N

Figure 10
Indicative Turbine Locations

Hill of Forss
Ecology