

Norfolk Boreas Offshore Wind Farm

Appendix 9.3

Bat Activity Survey Reports

Applicant: Norfolk Boreas Limited
Document Reference: 5.3.9.3
Pursuant to: APFP Regulation: 5(2)(g)

Author: Norfolk Wildlife Services
Revision: Version 1
Date: June 2019

Photo: Ormonde Offshore Wind Farm

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Norfolk Vanguard Bat activity surveys

Report prepared by Norfolk Wildlife Services Ltd.
on behalf of Royal HaskoningDHV
February 2018

Reference: 2016/131.3

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Version Number	Date	Section(s)	Page(s)	Summary of Changes	Approved by
1	09/11/17	All	All	First draft for client	CS
5	22/12/17	All	All	Second draft for client	CS
6	12/01/18	All	All	Third draft for client	CS
7	08/02/18	All	All	Final report	CS

2. Executive Summary

2.1. The Norfolk Vanguard Extended Phase 1 Habitat Survey (Royal HaskoningDHV, 2017a) identified 167 linear features as providing “moderate” or “high” suitability to support commuting or foraging bats. Following a review of the linear features data, groupings of these features were made which identified 59 survey locations. For practical purposes of data collection and proportionality, these 59 survey locations were proposed to be surveyed using 25 separate transects.

2.2. The purpose of the surveys was to ascertain, based on transect and static detector surveys, whether bats are commuting or foraging along linear features identified by the Extended Phase 1 Habitat Survey as providing “moderate” or “high” suitability for supporting commuting or foraging bats, and if so, which species and in what numbers.

2.3. The following guidance document was used to inform development of the survey methodology: Bat surveys for professional ecologists: good practice guidelines. Bat Conservation Trust. (Collins (Ed), 2016). A specific protocol is set out in this document and any divergences in practice from this protocol during delivery are noted to allow an assessment of constraints.

2.4. Between May and October 2017, a total of 1839 complete nights of static detection at 68 locations and 184 transects at 27 transect locations were carried out. Recordings were subject to analysis using Kaleidoscope acoustic analysis software, and the results subsequently quality assured¹.

2.5. Bats were recorded on all transects. Evidence of the following species were found within the study area:

Barbastelle	<i>Barbastella barbastellus</i>
Serotine	<i>Eptesicus serotinus</i>
Myotis aggregate	<i>Myotis spp</i>
Daubenton’s	<i>Myotis daubentonii</i>
Noctule	<i>Nyctalus noctula</i>
Leisler’s bat	<i>Nyctalus leisleri</i>
Nathusius’ pipistrelle	<i>Pipistrellus nathusii</i>
Common pipistrelle	<i>Pipistrellus pipistrellus</i>
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>
Brown long-eared	<i>Plecotus auritus</i>

2.6. Of the 27 transects surveyed, evidence of barbastelles was recorded at 22, including transects BACT 4, 5, 8, 9, 10, 13, 14, 16, 17, 18, 19, 20, 21, 22, 24, 26, 28, 30, 31, 32, 33, and 34.

2.7. Summary results, including number of bat passes along key transects for each species, are presented for each locality and additional details are given in a short separate report for each location. Full field survey results and associated static and transect recordings are available.

2.8. No surveys were able to be carried out on any transects in April 2017. Some limited data was available from statics in early May from this spring 2017 period. There is therefore

¹ Quality assurance is ongoing at the time of writing.

a general limitation with lack of survey information during the early spring period for a number of transects surveyed. Nevertheless, these transects are considered to provide valuable data for understanding bat activity levels along the linear features covered by these transects.

2.9. No surveys were carried out on the following transects due to access issues: BACT 1, 2, 6, 7, 11, 12, 23 and 25. Only one survey was carried out at BACT 15 and 35 before access was rescinded. This was considered a significant limitation to being able to assess the suitability of the linear features for supporting commuting or foraging bats on these two transects.

3. Introduction

3.1. Project background

3.1.1. Norfolk Vanguard is a proposed offshore wind farm being developed by Norfolk Vanguard Limited (or an affiliate company), with a capacity of 1800MW, enough to power 1.3 million UK households. The offshore wind farm comprises two distinct areas, Norfolk Vanguard East (NV East) and Norfolk Vanguard West (NV West) and will be connected to the shore by offshore export cables installed within the provisional offshore cable corridor. The project will also require onshore infrastructure in order to connect the offshore wind farm to the National Grid at the existing National Grid substation at Necton, which in summary will comprise the following:

- Landfall;
- Cable relay station (if required);
- Underground cables;
- Onshore substation; and
- Extension to the existing Necton National Grid substation.

3.1.2. The location of the onshore electrical infrastructure is shown on Figure 1, Appendix A: of the Extended Phase 1 Habitat Survey Report (Royal HaskoningDHV, 2017a). Collectively the onshore electrical infrastructure is herein referred to as the 'onshore project area'.

3.1.3. During the development of the project, the onshore Scoping Area that was initially defined has been refined, to include three landfall options, associated cable relay search zones, as well as an onshore substation search zone in proximity to the Necton National Grid substation. A 200m wide cable corridor has been identified within which the buried cable will be located, and Horizontal Directional Drilling (HDD) zones and mobilisation zones have been identified along the cable corridor.

3.1.4. The surveys described within this report were designed and based on the onshore project area which was in use when the project Extended Phase 1 Habitat Survey was undertaken (February 2017). As the project design is further refined, these search zones will decrease in size, and the final options for the siting of infrastructure (i.e. one cable relay station, one landfall, one onshore substation) will be taken forward for the final Development Consent Order (DCO) application in June 2018.

3.2. Aim of report

3.2.1. As Norfolk Vanguard is a Nationally Significant Infrastructure Project (NSIP) an Environmental Impact Assessment (EIA) is required as part of a DCO application under the Planning Act 2008.

3.2.2. Norfolk Wildlife Services were appointed in late April 2017 to undertake additional ecological surveys to support this application as set out within the Survey Scope (Royal HaskoningDHV, 2017b).

3.3. Survey objective

3.3.1. To ascertain, based on transect and static detector surveys, whether bats are commuting or foraging along linear features identified by the Extended Phase 1 Habitat Survey as providing "moderate" or "high" suitability for supporting commuting or foraging bats, which species and in what numbers.

3.4. Survey scope

3.4.1. Development of survey scope

3.4.1.1. An Extended Phase 1 Habitat Survey of the project area was undertaken during February 2017, and reported in Norfolk Vanguard Offshore Wind Farm Extended Phase 1 Habitat Survey Report (Document ref: PB4476-003-040)).

3.4.1.2. The Extended Phase 1 Habitat Survey identified the potential for legally protected species located within the project area plus a 50m buffer surrounding the project area, and provided recommendations for further surveys required to characterise the ecological baseline for the project area.

3.4.1.3. Potential habitat features were identified and evaluated as to their suitability for foraging or commuting bats in the Extended Phase 1 Habitat Survey (Royal HaskoningDHV, 2017a). All those with “medium” or “high” potential were recommended by Royal HaskoningDHV (2017b) for additional surveys.

3.4.1.4. Norfolk Wildlife Services were appointed in late April 2017 to undertake additional ecological surveys to support this application as set out within the Survey Scope (Royal HaskoningDHV 2017b).

3.4.2. Scoping of survey locations

Transects

3.4.2.1. The Extended Phase 1 Habitat Survey (Royal HaskoningDHV, 2017a) identified 167 linear features as providing moderate or high suitability to support commuting or foraging bats. Following a review of the linear features data, groupings of these features were made which identified 59 survey locations.

3.4.2.2. In practice, survey access was not possible for all areas of each survey location. Therefore, for the purposes of data collection the 59 survey locations were proposed to be surveyed as 25 transects, each indexed by a number (BACT1, BACT2, etc.), encompassing as far as possible the groupings of identified linear features and in particular 59 survey locations (Royal HaskoningDHV 2017b).

Statics

3.4.2.3. 59 provisional static detector locations were set out within the Survey Scope (Royal HaskoningDHV, 2017b). These original locations identified potential representative points for groups of linear features and are shown within the maps for the Survey Scope.

3.4.2.4. The 59 identified survey locations were subsequently amended so that static detectors were grouped into the 25 transects areas (BACT1, BACT2) as far as possible, and each static detector location indexed by a number (BA1, BA2, etc.). Three detectors have been used on linear feature networks with at most “high suitability” to support commuting and foraging bats, and two detectors have been used on linear feature networks with at most “moderate suitability” to support commuting and foraging bats.

3.4.2.5. There was a maximum survey effort of 60 static locations proposed, one greater than the 59 static sampling points identified by the Extended Phase 1 Habitat survey.

4. Methodology

4.1. Section 4.1 sets out the proposed survey protocol as agreed between Royal HaskoningDHV and Norfolk Wildlife Services prior to any field work commencing, and Section 4.2 sets out how the surveys were delivered in practice in relation to the protocol and identifies any deviations or modifications that took place during the delivery phase.

4.1. Survey protocol

4.1.1. This Section details the proposed survey protocol as agreed between Royal HaskoningDHV and Norfolk Wildlife Services prior to any field work commencing.

Relevant guidance

4.1.2. The following guidance document was used to inform development of the survey methodology:

Collins, J. (Ed.). (2016). Bat surveys for professional ecologists: good practice guidelines. Third edition. Bat Conservation Trust.

Survey locations

4.1.3. Subsequent to the commencement of contract, a further area located along the Dilham Canal (BACT21) was identified as an additional site which may support commuting and foraging bats and included within the scope of works.

4.1.4. Survey locations are described in the table in Appendix 1: Transect details and descriptions Appendix 2: Static locations descriptions and are presented on maps in Appendix 5: Maps.

Survey methodology

4.1.5. A full technical protocol for the collection of data using SM4s and subsequent analysis is given in Annex 1: Process for auto identification.

Transects

4.1.6. Proposed transect routes will be designed in 25 locations, encompassing as many previously identified static points as possible.

4.1.7. For all habitats scoped into the assessment, bat activity transect surveys will be undertaken.

4.1.8. Transect surveys will involve walking at a constant speed along each linear bat habitat (or the one edge of the two-dimensional bat habitat) recording observations such as number of bats, flight direction, flight height, behaviour, appearance and relative speed. Weather conditions including temperature, wind speed and precipitation, will be recorded at the start and end of each survey visit.

4.1.9. Field observation will be relied upon as the primary method for species identification. Bat detectors will be used to listen to bats during surveys. An SM4 ZC unit with an attached GPS will be used to make a permanent record of the transect.

4.1.10. A field recording set will be retained in the compressed Zero Crossing Analysis (ZCA) format. Laboratory sound-analysis will subsequently be used to identify the calls of any bat species picked up using the bat detectors.

Statics

4.1.11. For all transects identified in the previous section, static detector surveys will be set up in parallel.

4.1.12. These will involve placement of a static detector at locations identified as suitable through judgement of the surveying ecologist whilst on site. SM4 ZC recorders will be

deployed in suitable locations separated from stock and other potential hazards. Where an SM4 ZC fails during deployment, the survey will be repeated.

4.1.13. Data from these surveys will be recorded and subject to sound-analysis to identify species and pass numbers following the survey.

Survey timing and weather conditions

Transects

4.1.14. For transects of “moderate” suitability for commuting or foraging bats scoped into the survey, these will be subject to one transect survey visit per month from April to October 2017(eight visits), including one dusk and pre-dawn survey within a 24-hour period.

4.1.15. For localities of “high” suitability for commuting or foraging bats, these will be subject to two survey visits per month from April to October (16 visits), including one dusk and pre-dawn survey within a 24-hour period.

4.1.16. The transect surveys will commence at sunset, and cease a minimum of 2 hours after sunset. Sunset and sunrise times will be standardised using the time and date website: <https://www.timeanddate.com/sun/uk/norwich>.

4.1.17. Surveys will not be carried out when the temperature is below 10°C at sunset/sunrise, or during heavy rain or strong wind unless justified by the surveying ecologist.

Statics

4.1.18. The surveys will use SM4 ZC static detectors. Deployment of SM4 ZC recorders will follow the user guide¹.

4.1.19. For transects identified as being of moderate habitat for commuting or foraging bats, static bat detector surveys will take place at two locations on five consecutive nights per month between April and October.

4.1.20. For transects identified as being of high suitability for commuting or foraging bats, static bat detector surveys will take place at three locations on five consecutive nights per month between April and October.

4.1.21. Static detector surveys will be programmed to commence 30 minutes before sunset, and cease 30 minutes after sunrise.

4.1.22. Periods of prolonged bad weather will be noted for static detectors.

Equipment

4.1.23. Whilst walking the transect, surveyors will use SM4 ZCA units with an attached GPS as well as their personal bat detectors to listen to any echolocation calls. The make of bat detector used by each surveyor will be recorded.

4.1.24. Wildlife Acoustics Kaleidoscope software will be used for analysis.

Personnel

4.1.25. All surveys will be undertaken by suitably experienced bat surveyors, who will either be members of CIEEM or act according to its code of conduct.

4.1.26. No lone working is permitted, each transect will be undertaken by a single surveyor. An additional safety worker will be present, but will only assist the surveyor (e.g. by note taking).

4.2. Survey delivery

4.2.1. The following section details how the work was delivered in relation to the protocol and identifies any deviations or modifications that took place during the delivery phase. The protocol was followed for the emergence surveys as far as possible or reasonable. Variations from this are noted in 4.2.2. Limitations.

4.2.1. Survey methodology as delivered

Survey access

4.2.1.1. Surveys were delivered on a total of 27 transects and 64 static detectors. A further four static detectors were also deployed outside of any established transect, due to changes in transect location (BA05, BA39, BA57 and BA61X).

4.2.1.2. Access to survey sites was on a voluntary basis by landowners and some proposed² transect routes could not be surveyed. Furthermore, some landowners withdrew access during the project. Details of access for each transect and any resultant alterations are given in Table 2.

Table 1 : Summary of areas where activity surveys carried out

Transect Habitat Suitability	Number
High	10
Medium	17
TOTAL	27

Table 2 : Transects surveys – details of access

Transects #	Habitat Suitability Assessment	Related statics	Details of access	Changes to transect
BACT01	Medium	None	Access not achieved	Replaced with BACT27
BACT02	Low	BA07, BA08	Access not achieved	Withdrawn
BACT03	Medium	BA06, BA69X	Access granted	-
BACT04	High	BA70X, BA71X	Access permission withdrawn by landowner on 24.08.17	No further surveys after that date
BACT05	High	BA10, BA11, BA95X	Access granted	-
BACT06	Medium	BA14, BA15, BA16	Access not achieved	Replaced with BACT28
BACT07	Medium	BA17, BA18, BA19	Access not achieved	Withdrawn
BACT08	Medium	BA20, BA21	Access granted	-
BACT09	High	BA23, BA92X, BA97X	Access granted	-
BACT10	High	BA24, BA72X, BA98X	Access granted	-
BACT11	Medium	BA27, BA28	Access not achieved	Replaced with BACT29
BACT12	Medium	BA29	Access not achieved	Replaced with BACT30
BACT13	Medium	BA73X, BA74X	Access granted	-
BACT14	High	BA63X, BA66X, BA100X	Access granted	-
BACT15	Medium	BA32, BA33	Access permission withdrawn by landowner on 12.06.17	Replaced with BACT31
BACT16	Medium	BA35, BA75	Access granted	-
BACT17	Medium	BA91X, BA37	Access granted	-

² Transects proposed within the Royal HaskoningDHV Survey Scope (Royal HaskoningDHV, 2017b)

Transects #	Habitat Suitability Assessment	Related statics	Details of access	Changes to transect
BACT18	Medium	BA43, BA44	Access granted	-
BACT19	Medium	BA55, BA56	Access granted	-
BACT20	High	BA02, BA03, BA04	Access permission withdrawn by landowner on 30.08.17	No further surveys after that date
BACT21	High	BA62X, BA76X, BA106X	Access granted	-
BACT22	High	BA48, BA60X, BA107X	Access granted	-
BACT23	Medium	None	Access not achieved	Withdrawn
BACT24	Medium	BA65X, BA108X	Access permission withdrawn by landowner on 24.08.17	Replaced by BACT34; no further surveys after that date
BACT25	Medium	BA77X, BA78X	Access not achieved	Replaced with BACT28
BACT26	Medium	BA79X, BA08X	Access granted	-
BACT27	Medium	BA81X, BA82X	Access granted	-
BACT28	Medium	BA13, BA111X	Access granted	-
BACT29	Medium	BA25, BA26	Access granted	-
BACT30	Medium	BA64X, BA87X,	Access granted	-
BACT31	High	BA67X, BA68X, BA114X	Access granted	-
BACT32	Medium	BA88X, BA89X	Access granted	-
BACT33	Medium	BA40, BA41	Access granted	-
BACT34	Medium	BA52, BA90X	Access granted	-
BACT35	Medium	BA118X, BA119X	Access permission withdrawn by landowner on 24.08.17	No further surveys after that date

Transects survey effort

4.2.1.3. A summary of survey effort by month is given in Table 3 below.

Table 3 : Transects surveys – dates of surveys by month

Transects #	Habitat Suitability Assessment	April 2017	May 2017	June 2017	July 2017	August 2017	September 2017	October 2017	Total number of surveys
BACT03	Medium	No survey	No survey	No survey	03/07/17; 04/07/17	03/08/17	01/09/17	26/10/17	5
BACT04	High	No survey	No survey	20/06/17; 21/06/17	03/07/17	03/08/17; 14/08/17	No survey	No survey	5
BACT05	High	No survey	25/05/17	12/06/17; 26/06/17	18/07/17	08/08/17; 22/08/17	06/09/17; 19/09/17	03/10/17; 04/10/17; 17/10/17	11
BACT08	Medium	No survey	22/05/17	02/06/17; 12/06/17	11/07/17; 14/07/17	07/08/17	04/09/17; 12/09/17	02/10/17	9
BACT09	High	No survey	10/05/17	13/06/17; 29/06/17	13/07/17; 27/07/17	29/08/17	12/09/17; 26/09/17; 27/09/17	10/10/17; 24/10/17	11
BACT10	High	No survey	10/05/17	No survey	07/07/17; 18/07/17	04/08/17; 25/08/17	22/09/17; 29/09/17	06/10/17; 20/10/17	9
BACT13	Medium	No survey	26/05/17	19/06/17; 21/06/17	No survey	18/08/17; 19/08/17	18/09/17	31/10/17	7
BACT14	High	No survey	No survey	08/06/17; 22/06/17	06/07/17; 27/07/17	10/08/17; 31/08/17	14/09/17; 15/09/17; 28/09/17	12/10/17; 26/10/17	11
BACT 15	Medium	No survey	No survey	07/06/17	No survey	No survey	No survey	No survey	1
BACT16	Medium	No survey	No survey	No survey	04/07/17	02/08/17; 15/08/17	07/09/17	05/10/17; 06/10/17	6
BACT17	Medium	No survey	30/05/17	23/06/17	24/07/17	14/08/17	11/09/17; 12/09/17	09/10/17	7
BACT18	Medium	No survey	24/05/17	01/06/17	12/07/17	16/08/17	20/09/17; 21/09/17	23/10/17	7
BACT19	Medium	No survey	No survey	09/06/17; 25/06/17	05/07/17	16/08/17	06/09/17; 07/09/17	18/10/17	7
BACT20	High	No survey	15/05/17; 30/05/17	26/06/17	12/07/17; 13/07/17; 31/07/17	21/08/17	No survey	No survey	7
BACT21	High	No survey	22/05/17; 31/05/17	19/06/17; 29/06/17	31/07/17	07/08/17; 30/08/17	04/09/17; 18/09/17; 19/09/17	03/10/17; 17/10/17	12
BACT22	High	No survey	22/05/17	15/06/17	No survey	22/08/17; 23/08/17; 29/08/17	12/09/17; 26/09/17	10/10/17; 24/10/17	9
BACT24	Medium	No survey	No survey	07/06/17	No survey	No survey	No survey	No survey	1

Transects #	Habitat Suitability Assessment	April 2017	May 2017	June 2017	July 2017	August 2017	September 2017	October 2017	Total number of surveys
BACT26	Medium	No survey	No survey	20/06/17; 21/06/17	31/07/17	08/08/17	21/09/17	05/10/17	6
BACT27	Medium	No survey	No survey	13/06/17	03/07/17	30/08/17	08/09/17; 09/09/17	13/10/17	6
BACT28	Medium	No survey	No survey	21/06/17; 30/06/17	19/07/17	23/08/17	13/09/17; 14/09/17	11/10/17	7
BACT29	Medium	No survey	No survey	No survey	04/07/17	11/08/17; 30/08/17	04/09/17; 05/09/17	02/10/17	6
BACT30	Medium	No survey	26/05/17	28/06/17	25/07/17	22/08/17	19/09/17; 20/09/17	19/10/17	7
BACT31	High	No survey	No survey	12/06/17; 26/06/17	12/07/17; 26/07/17	23/08/17; 31/08/17	01/09/17; 15/09/17	09/10/17; 25/10/17	10
BACT32	Medium	No survey	No survey	15/06/17	12/07/17	15/08/17; 16/08/17	19/09/17	No survey	5
BACT33	Medium	No survey	No survey	14/06/17	21/07/17	24/08/17; 25/08/17	29/09/17	No survey	5
BACT34	Medium	No survey	No survey	30/06/17	05/07/17;	17/08/17	12/09/17	10/10/17; 11/10/17	6
BACT35	Medium	No survey	No survey	No survey	30/07/17	No survey	No survey	No survey	1

Statics survey effort

4.2.1.4. Full dates for static deployments are given in Appendix 4 : Details of static deployments.

Table 4 : Static surveys –total deployment nights for each transect

Transect location	Total nights deployment on transect for all statics
BACT03	37
BACT04	55
BACT05	88
BACT08	90
BACT09	95
BACT10	92
BACT13	45
BACT14	95
BACT15	10
BACT16	54
BACT17	77
BACT18	68
BACT19	54
BACT20	173
BACT21	106
BACT22	77
BACT24	6
BACT26	48
BACT27	45
BACT28	52
BACT29	52
BACT30	66
BACT31	113
BACT32	64
BACT33	55
BACT34	50
BACT35	18
Unassociated	54
Grand Total	1839

4.2.1.5. A summary of survey effort by month is given in the following table. Please note that deployments at end of months may overlap into the following month.

Table 5 : Static surveys –total nights each month deployment per static detector

Transect reference	Static point	May 2017	June 2017	July 2017	August 2017	September 2017	October 2017
BACT03	BA06	0	0	3	4	6	5
BACT03	BA69X	0	0	3	4	6	6
BACT04	BA70X	0	6	4	6	0	0
BACT04	BA71X	0	5	0	14	0	0
BACT04	BA93X	0	2	4	14	0	0
BACT05	BA10	7	11	3	6	4	5
BACT05	BA11	7	7	0	6	7	6
BACT05	BA95X	0	4	0	5	4	6
BACT08	BA20	0	18	13	1	8	9
BACT08	BA21	0	18	6	0	8	9
BACT09	BA23	10	5	9	6	5	7
BACT09	BA92X	0	9	8	6	2	9
BACT09	BA97X	0	0	8	6	0	5
BACT10	BA24	9	0	12	6	5	5
BACT10	BA72X	0	0	11	6	5	5
BACT10	BA98X	0	0	12	6	5	5
BACT13	BA73X	0	4	0	5	7	6
BACT13	BA74X	0	4	0	6	7	6
BACT14	BA100X	0	5	5	6	5	5
BACT14	BA63X	6	5	5	5	5	5
BACT14	BA66X	0	11	10	5	6	6
BACT15	BA32	0	5	0	0	0	0
BACT15	BA33	0	5	0	0	0	0
BACT16	BA35	0	0	6	13	3	5
BACT16	BA75X	0	0	6	14	3	4
BACT17	BA36	8	0	0	0	0	0
BACT17	BA37	8	4	0	0	8	7
BACT17	BA38	8	0	4	0	0	0
BACT17	BA91X	0	4	4	7	8	7

Transect reference	Static point	May 2017	June 2017	July 2017	August 2017	September 2017	October 2017
BACT18	BA43	8	5	5	5	4	6
BACT18	BA44	8	5	5	5	5	7
BACT19	BA55	0	9	6	0	5	5
BACT19	BA56	0	9	6	9	0	5
BACT20	BA02	16	15	5	24	0	0
BACT20	BA03	16	9	13	24	0	0
BACT20	BA04	16	14	4	17	0	0
BACT21	BA106X	0	7	7	7	9	4
BACT21	BA62X	14	7	6	7	14	5
BACT21	BA76X	0	7	0	6	0	6
BACT22	BA107X	0	0	0	3	8	6
BACT22	BA48	7	5	0	6	8	6
BACT22	BA60X	9	0	0	7	6	6
BACT24	BA65X	0	6	0	0	0	0
BACT26	BA79X	0	6	1	8	5	6
BACT26	BA80X	0	6	3	2	5	6
BACT27	BA81X	0	6	4	13	0	5
BACT27	BA82X	0	6	4	2	0	5
BACT28	BA111X	0	5	5	5	5	5
BACT28	BA13	0	6	5	6	5	5
BACT29	BA25	0	0	6	9	7	4
BACT29	BA26	0	0	1	10	8	7
BACT30	BA64X	11	6	4	5	5	5
BACT30	BA87X	0	6	6	7	6	5
BACT31	BA114X	0	4	5	8	5	5
BACT31	BA67X	0	11	5	8	6	8
BACT31	BA68X	0	11	13	6	10	8
BACT32	BA88X	0	8	5	5	6	7
BACT32	BA89X	0	8	5	6	7	7
BACT33	BA40	0	5	5	6	5	7
BACT33	BA41	0	5	5	5	5	7
BACT34	BA52	0	11	6	7	7	0
BACT34	BA90X	0	5	6	3	0	5

Transect reference	Static point	May 2017	June 2017	July 2017	August 2017	September 2017	October 2017
BACT35	BA118X	0	0	0	9	0	0
BACT35	BA119X	0	0	0	9	0	0
External	BA05	21	0	0	0	0	0
External	BA39	8	0	0	0	0	0
External	BA57	0	5	0	0	0	0
External	BA61X	15	5	0	0	0	0

4.2.1.6. No surveys were carried out at the following static points.

Table 6 : Static surveys

Static point	Transect reference	May 2017	June 2017	July 2017	August 2017	September 2017	October 2017
BA01	None	0	0	0	0	0	0
BA09	None	0	0	0	0	0	0
BA12	None	0	0	0	0	0	0
BA30	None	0	0	0	0	0	0
BA31	None	0	0	0	0	0	0
BA45	None	0	0	0	0	0	0
BA46	None	0	0	0	0	0	0
BA47	None	0	0	0	0	0	0
BA49	None	0	0	0	0	0	0
BA50	None	0	0	0	0	0	0
BA51	None	0	0	0	0	0	0
BA59	None	0	0	0	0	0	0

Timing and weather conditions

4.2.1.7. The weather conditions and timings during the surveys are given in the following table. An assessment of any related limitations for each survey can be found in 4.2.2. Limitations.

4.2.1.8. In general, the weather throughout the 2017 survey season was warm and dry with light wind conditions consistent as specified in Survey Protocol as suitable survey conditions, with only occasional surveys being cancelled due to bad weather. Storm Aileen impacted the UK on 12 -13 September 2017 and associated weather effects persisted for a week which impacted on static surveys during this period. Otherwise no extreme weather events were noted.

Personnel and Equipment

4.2.1.9. All surveys were undertaken by experienced bat surveyors, who are listed below in Table 7 below. Surveyors were accompanied by a safety worker on all surveys.

4.2.1.10. Bat surveys were recorded using an SM4, but surveyors also had personal equipment as shown below.

Table 7 : Surveyor experience

Team member	Experience	Memberships	Equipment used
James Allitt	14 years' experience of ecological surveying, including bats	-	Batbox Duet
Karl Charters	20 years' experience in ecological surveying, including bats. Holds a level 1 bat licence	-	Batbox Duet
Ben Christie	5 years' experience in ecological surveying, including bats. Holds a level 1 bat licence	GradCIEEM	Batbox Duet
James Goldsmith	8 years' experience in ecological surveying, including bats. Holds a level 1, 3 and 4 bat licence	-	Echo Meter Touch
Abi Gray	6 years' experience in ecological surveying, including bats. Holds a level 2 bat licence	ACIEEM	Echo Meter EM3
Ben Moore	2 years' experience of ecological surveying, including bats	GradCIEEM	Batbox Duet
Sally McColl	10 years' experience of ecological surveying, including bats	-	Batbox Duet
Carolyn Smith	4 years' experience of ecological surveying, including bats	GradCIEEM	Batbox Duet
Sue Traer	15 years' experience in ecological surveying, including bats. Holds a level 1 bat licence	MCIEEM	Echo Meter Touch
John Worthington-Hill	6 years' experience in ecological surveying, including bats.	-	Batbox Duet
Lisa Treadwell	8 years' experience of ecological surveying, including bats	-	Batbox Duet
Chris Bawler	2 years' experience of ecological surveying, including bats.	-	Batbox Duet

4.2.2. Limitations

4.2.2.1. A summary of the survey limitations encountered for all transects is set out below. Detailed limitations for each survey transect, including any notable limitations which may affect data quality, are set out in Table 9.

Survey timing

4.2.2.2. No surveys were able to be carried out on any transects in April 2017. Some limited data was available from statics in early May from this spring 2017 period. There is therefore a general issue in lack of survey information during the spring period. This may affect results in habitats where there is significant seasonal variation in food supply availability e.g. flood plains and broadleaved woodland.

4.2.2.3. For many transects the length of the proposed transect route took less than two hours to survey in full. For these transects, surveyors visited at different times within the period from 30 minutes before dusk to two hours after dusk to ensure that species which are active early or late were covered. This is not anticipated to affect the quality of the data received.

4.2.2.4. The duration of surveys is given in Appendix 3: Transect survey effort

Weather conditions

4.2.2.5. Weather was calm, dry and mild during October 2017, and early autumn coverage for bats was therefore good where access was available to carry out the surveys. Weather conditions encountered during each survey are provided within Appendix 3.

Survey approach

4.2.2.6. Transects were limited in length by landownership boundaries in relation to features of interest meaning that in general transects were quicker than a two-hour walked duration. Where a circuit substantially exceeded an hour, a second circuit of the route was not made, due to the logistics e.g. taking the total duration to well over 2 hours and the difficulties of interpreting data e.g. where there was uneven coverage between survey visits.

4.2.2.7. Consequently many transects had below two hours of transect walking for bats, although some differences are relatively small. Each transect continued to have 12 two-minute stopping points. Surveyors were generally present at the transect location for additional periods of time, where:

1. They were awaiting the start time or had to walk to the start point for the survey
2. During or after the transect surveys, whilst deploying the static detectors.

4.2.2.8. This reduced walked effort deviates from the protocol. The duration of individual surveys is given in Appendix 3: Transect survey effort. Practically the differences are not seen as substantial since:

1. The walked transects are backed by substantial static datasets over an extended period
2. The statics are "back-to-back" with the walked transects, so form a logical continuation of them
3. The behavioural observations by surveyors are most powerful at sunset and during twilight when bats are still visible and this coverage remained.

4.2.2.9. No behavioural observations were available for static detector surveys, when deployed following transect surveys, but this was not seen as significant limitation. In practice since all transect surveys continued until complete darkness, surveyors' observations would have been limited to contacts on bat detectors with bats without further details e.g. on their exact locations or direction of flight, etc. In total there were 1839

complete nights of static detection compared to 184 transects. The curtailment of transects is not therefore seen as being a significant constraint on the results, especially with respect to presence/absence of particular species.

4.2.2.10. Statics were deployed by attachment to suitable objects such as trees and could not be placed in the open due to farming operations. The microphones on the statics are affected by surrounding clutter for example trees and buildings, but also the availability of suitable deployment sites means that they cannot be placed in open wetland areas. This is not seen as a major limitation, but may alter relative numbers of tracks.

Data analysis

4.2.2.11. Detectability of bats varies by species and the intensity and loudness of their calls. A classification for this is given within Barataud (2015). In general this is not seen as presenting a limitation to the survey results, but means that numerical results between species are not comparable.

4.2.2.12. It is likely that brown long-eared bat *Plecotus auritus*, which are exceptionally quiet in echolocating, will be significantly underrepresented within the results and may be present at sites where survey results indicate absence. This is a known issue and provide that this caveat is placed on the data, no other significant constraints are envisaged.

Limitations by transect

4.2.2.13. The table below (Table 8) compares the number of survey visits achieved for each transect throughout the year against the recommended number of visits set out in the survey protocol.

4.2.2.14. Table 9 summarises for each transect: Access limitations, including any visibility issues, weather and survey effort limitations for transects and static. It makes a categorical assessment as to whether these limitations significantly affect the quality of the data. Transects highlighted in orange have significant limitations.

Table 8 : Details of specified transect visit effort versus actual survey effort

Transects #	Habitat Suitability Assessment	SPRING			SUMMER			AUTUMN		Total number of surveys	Programmed number	Variation
		April 2017	May 2017	June 2017	July 2017	August 2017	September 2017	October 2017				
BACT03	Medium	No survey	No survey	No survey	2	1	1	1	5	8	3	
BACT04	High	No survey	No survey	2	1	2	No survey	No survey	5	15	10	
BACT05	High	No survey	1	2	1	2	2	3	11	15	4	
BACT08	Medium	No survey	1	2	2	1	2	1	9	8	-1	
BACT09	High	No survey	1	2	2	1	3	2	11	15	4	
BACT10	High	No survey	1	No survey	2	2	2	2	9	15	6	
BACT13	Medium	No survey	1	2	No survey	2	1	1	7	8	1	
BACT14	High	No survey	No survey	2	2	2	3	2	11	15	4	
BACT 15	Medium	No survey	No survey	1	No survey	No survey	No survey	No survey	1	8	7	
BACT16	Medium	No survey	No survey	No survey	1	2	1	2	6	8	2	
BACT17	Medium	No survey	1	1	1	1	2	1	7	8	1	
BACT18	Medium	No survey	1	1	1	1	2	1	7	8	1	
BACT19	Medium	No survey	No survey	2	1	1	2	1	7	8	1	
BACT20	High	No survey	2	1	3	1	No survey	No survey	7	15	8	
BACT21	High	No survey	2	2	1	2	3	2	12	15	3	
BACT22	High	No survey	1	1	No survey	3	2	2	9	15	6	
BACT24	Medium	No survey	No survey	1	No survey	No survey	No survey	No survey	1	15	14	
BACT26	Medium	No survey	No survey	2	1	1	1	1	6	8	2	

		SPRING			SUMMER			AUTUMN				
Transects #	Habitat Suitability Assessment	April 2017	May 2017	June 2017	July 2017	August 2017	September 2017	October 2017	Total number of surveys	Programmed number	Variation	
BACT27	Medium	No survey	No survey	1	1	1	2	1	6	8	2	
BACT28	Medium	No survey	No survey	2	1	1	2	1	7	8	1	
BACT29	Medium	No survey	No survey	No survey	1	2	2	1	6	8	2	
BACT30	Medium	No survey	1	1	1	1	2	1	7	8	1	
BACT31	High	No survey	No survey	2	2	2	2	2	10	15	5	
BACT32	Medium	No survey	No survey	1	1	2	1	No survey	5	8	3	
BACT33	Medium	No survey	No survey	1	1	2	1	No survey	5	8	3	
BACT34	Medium	No survey	No survey	1	1	1	1	2	6	8	2	
BACT35	Medium	No survey	No survey	No survey	1	No survey	No survey	No survey	1	8	7	

Table 9 : Survey limitations – combined static and manual surveys

Survey Location	Habitat Suitability Assessment	Access limitations, including any visibility issues	Weather limitations	Survey effort – <u>Transect Static</u>	Limitation to survey results
BACT01		N/A	N/A	N/A	Significant impact. Unable to assess any potential bat activity.
				N/A	
BACT02		N/A	N/A	N/A	Significant impact. Unable to assess any potential bat activity.
				N/A	
BACT03	Medium	None	None	No survey in April, May or June 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No survey in April, May 2017; Statics deployed for less than 10 days in July and August 2017	
BACT04	High	Access permission withdrawn by landowner on 24.08.17	03/08/17 – Wind BWS4; 14/08/17 – Rain at start	No surveys in April, May, September or October 2017; Only 1 survey in July 2017; Two surveys not carried out within 24hour period	Moderate impact. Limited data regarding bat activity early or late in the season.
				No surveys April, May, September or October 2017; Statics deployed for less than 15 days in June and July 2017	
BACT05	High	None	10/05/17 – Starting temperature less than 10°C; 08/08/17 – Heavy rain for last 30minutes of survey	No survey in April 2017; Only 1 survey in May and July 2017.	No impact. Sufficient survey data to indicate bat activity.
				No surveys in April, May 2017	
BACT06		N/A	N/A	N/A	Significant impact. Unable to assess any potential bat activity.
				N/A	
BACT07		N/A	N/A	N/A	Significant impact. Unable to assess any potential bat activity.
				N/A	

Survey Location	Habitat Suitability Assessment	Access limitations, including any visibility issues	Weather limitations	Survey effort – <u>Transect</u> <u>Static</u>	Limitation to survey results
BACT08	Medium	None	None	No survey in April 2017; Two surveys not carried out within 24hour period	No impact. Sufficient survey data to indicate bat activity.
				No survey in April or May 2017; Statics deployed for less than 10 days in August 2017	
BACT09	High	None	29/08/17 and 12/09/17 – Wind BWS4	No survey in April 2017; Only 1 survey carried out in May and August 2017	No impact. Sufficient survey data to indicate bat activity.
				No survey April 2017; Statics deployed for less than 15 days in May, June and September 2017	
BACT10	High	None	None	No survey in April or June 2017; Only 1 survey carried out in May 2017; Two surveys not carried out within 24hour period	No impact. Sufficient survey data to indicate bat activity.
				No survey in April or June 2017; Statics deployed for less than 15 days in May 2017	
BACT11		N/A	N/A	N/A	Significant impact. Unable to assess any potential bat activity.
				N/A	
BACT12		N/A	N/A	N/A	Significant impact. Unable to assess any potential bat activity.
				N/A	
BACT13	Medium	None	None	No survey in April or July 2017	No impact. Sufficient survey data to indicate bat activity.
				No survey in April, May or July 2017; Statics deployed for less than 10 days in June 2017	
BACT14	High	None	15/09/17 - Starting temperature less than 10°C; 27/07/17 – rain preceding survey; 14/09/17 – rain for last 10 minutes of survey	No survey in April or May 2017	No impact. Sufficient survey data to indicate bat activity.
				No survey in April 2017; Statics deployed for less than 15 days in May 2017	
BACT15	Medium	Access permission withdrawn by landowner on 12.06.17	N/A	N/A	Significant impact. Limited data regarding bat activity at the site.

Survey Location	Habitat Suitability Assessment	Access limitations, including any visibility issues	Weather limitations	Survey effort – <u>Transect</u> Static	Limitation to survey results
				No surveys in April, May or July-October 2017	
BACT16	Medium	None	07/09/17 - Rain	No surveys in April, May or June 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April-June 2017; Statics deployed for less than 10 days in September and October 2017	
BACT17	Medium	None	11/09/17 – Wind BWS4; 24/07/17 – Heavy drizzle before survey and for last hour	No survey in April 2017	No impact. Sufficient survey data to indicate bat activity.
				No survey in April 2017; Statics deployed for less than 10 days in June-August 2017	
BACT18	Medium	None	None	No survey in April 2017	No impact. Sufficient survey data to indicate bat activity.
				No survey in April 2017; Statics deployed for less than 10 days in September 2017	
BACT19	Medium	None	18/10/17 – Wind BWS4	No surveys in April or May 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April or May 2017; Statics deployed for less than 10 days in August and September 2017	
BACT20	High	Access permission withdrawn by landowner on 30.08.17	15/05/17 – Wind BWS4	No surveys in April, September or October 2017	Moderate impact. Limited data regarding bat activity late in the season.
				No surveys in April, September or October 2017	
BACT21	High	None	None	No survey in April 2017; Only 1 survey in July 2017	No impact. Sufficient survey data to indicate bat activity.
				No survey in April 2017; Statics deployed for less than 15 days in May 2017	
BACT22	High	None	None	No surveys in April or July 2017; Only 1 survey in May and June 2017	No impact. Sufficient survey data to indicate bat activity.
				No surveys in April or July 2017; Statics deployed for less than 15 days in June 2017	

Survey Location	Habitat Suitability Assessment	Access limitations, including any visibility issues	Weather limitations	Survey effort – <u>Transect</u> Static	Limitation to survey results
BACT23		N/A	N/A	N/A	Significant impact. Unable to assess any potential bat activity.
				N/A	
BACT24	Medium	Access permission withdrawn by landowner on 24.08.17	None	No surveys in April- May or July-October 2017; Two surveys not carried out within 24hour period	Moderate impact. Limited data regarding bat activity mid and late in the season.
				No survey in April, May or July-October 2017; Statics deployed for less than 15 days in June 2017	
BACT25		N/A	N/A	N/A	Significant impact. Unable to assess any potential bat activity.
				N/A	
BACT26	Medium	None	08/08/17 – Rain for last hour of survey; 05/10/17 – Rain showers	No surveys in April or May 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April or May 2017; Statics deployed for less than 10 days in July 2017	
BACT27	Medium	None	None	No surveys in April or May 2017	Moderate impact. Limited data regarding bat activity mid and late in the season.
				No surveys in April, May or September 2017; Statics deployed for less than 10 days in July 2017	
BACT28	Medium	None	14/09/17 - Starting temperature less than 10°C	No surveys in April or May 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April or May 2017	
BACT29	Medium	None	02/10/17 – Wind BWS4	No surveys in April or May 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April or May 2017; Statics deployed for less than 10 days in July 2017	
BACT30	Medium	None	20/09/17 - Starting temperature less than 10°C	No survey in April 2017	No impact. Sufficient survey data to indicate bat activity.

Survey Location	Habitat Suitability Assessment	Access limitations, including any visibility issues	Weather limitations	Survey effort – <u>Transect</u> <u>Static</u>	Limitation to survey results
				No survey in April 2017	
BACT31	High	None	None	No surveys in April or May 2017; Two surveys not carried out within 24hour period	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April or May 2017	
BACT32	Medium	None	None	No surveys in April, May or October 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April or May 2017	
BACT33	Medium	None	None	No surveys in April, May or October 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April or May 2017	
BACT34	Medium	None	30/06/07 and 10/10/17 – Wind BWS4; 12/09/17 – Rain mid survey for 5 minutes	No surveys in April or May 2017	Moderate impact. Limited data regarding bat activity early in the season.
				No surveys in April or May 2017; Statics deployed for less than 10 days in September and October 2017	
BACT35	Medium	Access permission withdrawn by landowner on 24.08.17	None	No surveys in April-June or August-October 2017; Two surveys not carried out within 24hour period	Significant impact. Limited data regarding bat activity at the site.
				No surveys in April-June or August-October 2017	
BA05	N/A	None	None	21 days in May 2017 only	Significant impact. Limited data regarding bat activity at the site but may be of value.
BA39	N/A	None	None	8 days in May 2017 only	Significant impact. Limited data regarding bat activity at the site but may be of value.
BA57	N/A	None	None	5 days in June 2017 only	Significant impact. Limited data regarding bat activity at the site but may be of value.

Survey Location	Habitat Suitability Assessment	Access limitations, including any visibility issues	Weather limitations	Survey effort – <u>Transect</u> Static	Limitation to survey results
BA61X	N/A	None	None	15 days in May 2017; 5 days June 2017	Significant impact. Limited data regarding bat activity at the site but may be of value.

5. Results

5.1. A description of each site can be found in Appendix 1: Transect details and descriptions.

5.2. Summary results for each transect are given in Table 11 : Summary of results for each transect below.

5.3. Full results are provided in the standalone ‘Transect Summary’ documents provided alongside this report.

Table 10 : Explanation of species, status and categories in results

Species	Latin	Code	Notes ³	UK status ⁴
Barbastelle	<i>Barbastella barbastellus</i>	BARBAR	Sec 41; Annx II; IUCN NT	Rare
Serotine	<i>Eptesicus serotinus</i>	EPTSER	IUCN LT	Uncommon, largely restricted to south
Large bat	<i>Not applicable</i>	LARGEBAT	Bat calls with FME<30kHz, but not identifiable further	Not applicable
Myotis aggregate	<i>Myotis spp</i>	MYOSPP	Aggregated; sometimes identifiable in field	Various
Daubenton's	<i>Myotis daubentonii</i>	MYODAU	IUCN LT; Identifiable by behavior when foraging over water bodies	Common
Noise	<i>Not applicable</i>	NOISE	Noise includes non-bat sounds, ambient sounds and any track <3 pulses	Not applicable
Noctule	<i>Nyctalus noctula</i>	NYCNOC	Sec 41; IUCN LT;	Uncommon
Leisler's bat	<i>Nyctalus leisleri</i>	NYCLEI	IUCN LT; confirmed potential calls from statics	Uncommon in GB although may be under recorded, common in Ireland
Other	<i>Not applicable</i>	OTHER	All bats not identifiable to another level; any non-identifiable potential social calls	Not applicable
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	PIP NAT	IUCN LT;	Uncommon but widespread, may be under recorded
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	PIPPIP	IUCN LT;	Common
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	PIPPYG	Sec 41'; IUCN LT;	Common
Brown long-eared	<i>Plecotus auritus</i>	PLEAUR	Sec 41; IUCN LT; low detectability	Common

Abbreviations

*IUCN categories: LC is Least Concern, NT is Near Threatened, DD is Data deficient; see www.iucnredlist.org for more details.

Sec 41 : Section 41 species of principal importance; often referred to as BAP species.

Annx II : Annex II of European Habitats Directive; all bats are protected under Annex IV.

³ Source : Bat Conservation Trust (2016) Table of legal and conservation status of UK bat species. www.bats.org.uk/publications.../Table_of_legal_and_conserv_status_of_UK_bats.pdf

⁴ Source : Bat Conservation Trust (2014) The state of the UK's bats 2014 National Bat Monitoring Programme Population Trends <http://www.bats.org.uk/pages/nbmp.html>

Table 11 : Summary of results for each transect

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT01	N/A	N/A	✘	✘	N/A	N/A
BACT02	N/A	N/A	✘	✘	N/A	N/A
BACT03	Medium	NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PIPSPP*, PLEAUR*	✓	✓	The tree line around the lodge in the centre north of the transect was a good commuting route for bats. The hedgerow along the southern boundary with the road provided good commuting links. The eastern boundary of the transect was good foraging habitat.	N/A
BACT04	High	BARBAR*, EPTSER*, LARGE BATSP*, MYOSPP*, NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PIPSPP PLEAUR*	✓	✓	The tree belt was an excellent commuting and foraging route. The pond was used by foraging bats. Common and soprano pipistrelles were only recorded between walk 5 and stop 12. Even on the dawn where the transect was reversed and started at stop 12 bats were only recorded up until walk 5.	Occasional barbastelles recorded to the north of the transect at BA70X.
BACT05	High	BARBAR*, EPTSER*, LARGE BATSP*, MYOSPP*, NYCLEI*, NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PIPSPP PLEAUR*	✓	✓	Key commuting features were hedgerows along field boundaries and the minor road. There were no major breaks in commutable habitat throughout the transect route, with largely intact hedgerows between woodlands. Key foraging habitat was evident within the western section between Walk 1 and Stop 5 and between Walk 8 and Stop 10 in the eastern section.	Barbastelles recorded by statics at the eastern and western areas on the transect at BA11 and BA95X.
BACT06	N/A	N/A	✘	✘	N/A	N/A
BACT07	N/A	N/A	✘	✘	N/A	N/A

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT08	Medium	BARBAR*, EPTSER*, MYOSPP, NYCNOC, PIPPIP, PIPPYG, PLEAUR*	✓	✓	The hedgerows provide good commuting routes with the woodlands providing good connecting habitat. The area of wet grassland to the north provides good foraging habitat	Barbastelles recorded by static detector along the eastern boundary of the transect.
BACT09	High	BARBAR*, MYOSPP, NYCLEI*, NYCNOC, PIP NAT*, PIPPIP, PIPPYG	✓	✓	Along the north small tree lined stream runs E-W and adjoins the nearby river Wensum. This stream and tree line also connects to the west of the transect where there is a strip of deciduous woodland. The woodland running along the western edge of the transect provides a good foraging route.	Barbastelles foraging along the northern edge of the transect above tree lined stream.
BACT10	High	BARBAR*, EPTSER*, MYOSPP, NYCNOC, PIP NAT*, PIPPIP, PIPPYG	✓	✓	River Wensum provides a high quality commuting and foraging route, most notably Daubentons. Hedgerow through the centre of the site also follows drainage ditches and along its length includes large oak standards. A cut channel runs parallel to the river is wider and more open than the other drainage ditches, a key corridor feature for pipistrelles.	Barbastelles recorded along the north-western corner along native species rich hedgerow.
BACT11	N/A	N/A	✗	✗	N/A	N/A
BACT12	N/A	N/A	✗	✗	N/A	N/A
BACT13	Medium	BARBAR*, LARGE BATS P NYNOC, MYOSPP*, PIPPIP, PIPPYG, PIPSPP	✓	✓	The Marriott's way is an excellent commuting route connecting woodlands to the east at Reepham to wet grassland areas in the west.	Single barbastelle pass recorded by transect detector.

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT14	High	BARBAR*, EPTSER*, NYNOC, MYOSPP*, PIPPIP, PIPPYG, PLEAUR*	✓	✓	Northern section parallel to the road, less favourable to bats with only commuting Noctules registering. Mixed native species along the southern boundary - good linking habitat from East (deciduous woodland) to the West boundary (wet deciduous woodland). Marriott's way (runs east to West to the south of the site) excellent commuting route, which connects other nearby patches of woodland.	Barbastelles frequently recorded along the south and western edges of the transect.
BACT15	Medium	EPTSER*, NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PLEAUR*	✓	✓	The woodland strip has good connectivity with the wider landscape through adjoining hedgerows which further link to other nearby woodland patches. The woodland and wet grassland to the SW of the transect provide excellent foraging and commuting habitat for bats.	N/A
BACT16	Medium	BARBAR*, EPTSER*, LARGE BATSPP, MYOSPP*, NYCLEI, NYCNOC, PIP NAT*, PIPPIP, PIPPYG, PIPSPP, PLEAUR*	✓	✓	The hedgerows along the western edge of the transect provided a commuting and foraging route for both common and soprano pipistrelles.	Occasional barbastelles records across the transect being recorded at both statics.

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT17	Medium	BARBAR*, EPTSER*, LARGEATSPP, MYOSPP*, NYCLEI*, NYCNOC, PIPNAT*, PIPPIP, PIPPYG, PIPSPP*, PLEAUR	✓	✓	Colby Road was a good commuting route. The hedgerow which runs south from stop point three was another commuting route with bats recorded commuting south into the transect area. The south-western field margins were key foraging areas for common and soprano pipistrelles.	Occasional barbastelles records across the transect being recorded at both statics.
BACT18	Medium	BARBAR*, EPTSER*, LARGEATSPP, MYOSPP*, NYCNOC, PIPNAT*, PIPPIP, PIPPYG, PLEAUR*	✓	✓	The pond was a key foraging area for common pipistrelles. Lyngate Road (along the southern boundary of the transect) was noted as a key foraging route, as was the northern boundary for common and soprano pipistrelle.	Within 10km of Paston SAC. Barbastelle activity recorded by BA43 along Lyngate Road to the west of the transect.
BACT19	Medium	BARBAR*, EPTSER*, LARGEATSPP, MYOSPP*, NYCNOC, PIPNAT, PIPPIP, PIPPYG, PIPSPP	✓	✓	Key foraging area for bats, road and hedgerow to the west of the transect	Within 10km of Paston SAC. Scarce records on BA55, north-west area
BACT20	High	BARBAR*, EPTSER*, LARGEATSPP*, MYOSPP*, NYCNOC, PIPNAT*, PIPPIP, PIPPYG, PIPSPP*, PLEAUR*	✓	✓	Features for commuting and foraging bats were largely restricted to arable hedgerows with field margins. There were two small areas of woodland suitable for foraging bats.	Active on the transect, recorded on static detectors BA03 and BA04.

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT21	High	BARBAR*, LARGEBATSPP, MYOSPP*, NYCNOC, PIP NAT, PIPPIP, PIPPYG	✓	✓	Noctules were often seen commuting from the south-west of the transect from an area of wet grassland with scattered standards. Common and soprano pipistrelles were frequently seen foraging above Hall Lane. Species of <i>Myotis</i> bats were recorded foraging along the North Walsham and Dilham Canal. Common and soprano pipistrelles were frequently seen and recorded foraging along the northern most edge of the arable field.	Within 10km of Paston SAC. Recorded between June and August, adjacent to the water treatment plant.
BACT22	High	BARBAR, EPTSER, LARGEBATSPP, MYOSPP, NYCNOC, PIP NAT, PIPPIP, PIPPYG	✓	✓	Excellent woodland habitat connecting to foraging areas within Witton Heath and beyond to the North Walsham and Dilham Canal. The western edge adjacent to the woodland was a key foraging and commuting route for bats. The road along the southern edge was a good foraging route for common pipistrelles	Within 10km of Paston SAC. Across the transect at all static detector locations. Foraging along the north-western and western woodland edges.
BACT23	N/A	N/A	✗	✗	N/A	N/A
BACT24	Medium	BARBAR*, EPTSER*, LARGEBATSPP, NYCNOC, PIP NAT*, PIPPIP, PIPPYG*	✓	✓	Munn's Track foraging corridor for pipistrelle bats. Common pipistrelles foraged above alder lined drainages ditches within the grassland to the north.	Within 10km of Paston SAC. Limited data. Single barbastelle pass at BA65X on western edge by wood.
BACT25	N/A	N/A	✗	✗	N/A	N/A

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT26	Medium	BARBAR*, EPTSER*, LARGEATSPP*, MYOSPP*, NYCLEI*, NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PIPSPP*, PLEAUR*	✓	✓	Pipistrelle foraging activity is high to the south of the transect at stop ten where the road joins the field. The western hedgerow is an important foraging and commuting route for bats.	One barbastelle recording on static detector BA80X.
BACT27	Medium	LARGEATSPP*, MYOSPP*, NYCLEI*, NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PIPSPP*, PLEAUR*	✓	✓	Hedgerows to the south and west of the site provided important foraging and commuting habitat for bats, including the woodland areas to the north east and south east. The oak tree near to stop 7 was an important foraging area for bats.	N/A
BACT28	Medium	BARBAR*, EPTSER*, LARGEATSPP*, MYOSPP*, NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PIPSPP*, PLEAUR*	✓	✓	The eastern and western hedgerows provided good commuting and foraging habitat for bats. The southern edge also provided opportunities for bats to forage along.	Solitary barbastelle calls across the summer
BACT29	Medium	EPTSER*, LARGEATSPP*, MYOSPP*, NYCLEI*, NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PIPSPP*, PLEAUR*	✓	✓	The western hedgerow has good connectivity within the wider landscape with other linear features and patches of deciduous woodland. The stream which runs along the north also has good links to other nearby linear features and joins to a large patch of woodland to the NW of the transect.	N/A

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT30	Medium	BARBAR*, EPTSER, NYCLEI*, MYOSPP, NYCNOC, PIP NAT, PIPPIP, PIPPYG, PIPSPP, PLEAUR*	✓	✓	Along the northern section of the transect is an optimal commuting and foraging habitat for bats. Due to the nature of its design, the old tree lined railway embankments provide cover from the weather for bats. The south-western and western lengths of the transect also provide good foraging habitat for bats.	Occasional barbastelle records on both static detectors.
BACT31	High	BARBAR*, EPTSER*, LARGEBATSPP*, MYOSPP*, NYCNOC*, PIP NAT*, PIPPIP, PIPPYG, PIPSPP, PLEAUR*	✓	✓	The River Bure which borders the transect from the north border all the way around to the eastern border provides an excellent foraging and commuting route for bats due to its linear characteristics and bankside tree line. The river is of particular interest for foraging Daubenton's which appear to forage most in areas where the river is widest due to cattle poaching. The short section along the south-western edge bordering the small patch of mature deciduous woodland proved excellent foraging ground for Pipistrelles. The low lying wet grassland contained abundant scattered dead (and living) trees with plenty of roost features for bats, although none were spotted entering or leaving. Centrally, an established, native, species-rich hedge bordered the arable field, and was favored by bats as both a commuting and foraging route.	Solitary barbastelle calls across the summer

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT32	Medium	BARBAR*, EPTSER*, LARGEBATSPP*, MYOSPP*, NYCLEI, NYCNOC*, PIP NAT*, PIPPIP, PIPSPP, PIPPYG,	✓	✓	The tree belt along the north and western boundary provides a linear feature and shelters from winds from the south to the north east. The road through the tree belt at the north of the transect creates a tunnel effect and a high proportion of activity was recorded. The site has good connectivity with the extended landscape.	Barbastelle activity across the transect, recorded on all statics and during transect visits.
BACT33	Medium	BARBAR*, EPTSER, LARGEBATSPP*, MYOSPP*, NYCLEI, NYCNOC*, PIP NAT, PIPPIP, PIPPYG, PIPSPP	✓	✓	The section of road along the north west of the transect (between stop eight and nine) was well sheltered by mature poplar trees and was a particularly popular foraging route. The hedgerows surrounding the transect provided foraging routes for pipistrelles. From the east of the site (continuing from walk three) a mature tree line extends southwards and adjoins a woodland which has further linear features running into the wider landscape. BACT33 is situated within 10km of Paston Great Barn.	Recorded across the transect but only a single pass on each static detector.
BACT34	Medium	BARBAR*, EPTSER*, LARGEBATSPP, MYOSPP*, NYCNOC, PIP NAT, PIPPIP, PIPPYG, PIPSPP, PLEAUR*	✓	✓	The key area for commuting and foraging bats was the western track with hedgerows either side. Intense use by common pipistrelles during some static deployments	Barbastelles recorded in the northwestern corner of the transect.

Transect	Habitat suitability assessment	Associated species	Species present		Key habitats and features for bats	Additional notes on bat activity
			Identified by transects	Identified by statics		
BACT35	Medium	LARGBATSP* , NYCNOC* , PIPPIP* , PIPPYG* , PIPSPP*	✓	✓	Hedgerows are good connecting features between the two woodlands at either end of the transect and foraging areas beyond. The north-western woodland has a ditch running along the eastern boundary and a small pond at the north-western end.	N/A

* - indicates limited or only possible records

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Appendix 1: Transect details and descriptions

Transect reference	OS grid references	Habitat Suitability Assessment	Description of transect context
BACT03	TF944124	Medium	Arable with minor road, Dale Road, splitting the eastern and western areas.
BACT04	TF916108	High	Arable with blocks of mixed woodland; small stream.
BACT05	TF970148	High	Mosaic of agricultural land, lowland deciduous woodland and lowland fen. Minor river valley at Dillington
BACT08	TG033166	Medium	Within river valley . Mixture of grassland and arable fields, bordered by hedgerows on all sides.
BACT09	TG038172	High	Within river valley. Arable at south; northern end wet grassland used for grazing by cattle.
BACT10	TG038176	High	Within river valley and the eastern and north-eastern bordered by the River Wensum.
BACT13	TG079236	Medium	A linear transect along the Marriots Way which is decommissioned railway line with grassland, tree and scrub mosaic and adjacent arable land.
BACT14	TG119240	High	Forestry plantation for Christmas trees of varied age with acid grassland patches and adjacent woodland and nearby minor river valley and Marriots Way
BACT15	TG203288	Medium	Arable land with bordering hedgerows and a small strip of woodland within the centre of the transect.
BACT16	TG212293	Medium	Arable land bordered by roads on the southern and northern edge with a main road, the A140 to the west.
BACT17	TG223304	Medium	Arable land, excluding the Western most field which was used for cattle grazing
BACT18	TG273317	Medium	Mainly arable land
BACT19	TG369304	Medium	Mainly arable land
BACT20	TF904104	High	Dominated by arable fields with hedgerows; links between large blocks of adjacent woodland
BACT21	TG295316	High	Adjacent land includes deciduous woodland and rough grassland; adjacent to Dilham Canal and river valley; Pigneys Wood nearby
BACT22	TG323313	High	Following field boundaries on two arable fields. Extensive woodlands of Witton Hall and Bacton Woods surround transect
BACT24	TG356303	Medium	Mainly arable land, with a track and double hedgerow running along the eastern section of the transect
BACT26	TF947132	Medium	Mainly arable land; small stream on parts
BACT27	TF955144	Medium	Network of arable fields with tall mixed native hedgerows with tree standards
BACT28	TF986154	Medium	Single arable field with continuous hedgerows along most boundaries.
BACT29	TG062203	Medium	Mainly arable land as was surrounding areas
BACT30	TG074228	Medium	Mainly arable land as was surrounding areas

Transect reference	OS grid references	Habitat Suitability Assessment	Description of transect context
BACT31	TG196288	High	At south-west along two lengths of an arable field ; adjacent patch of mature deciduous woodland to the west. River bure, Blickling estate
BACT32	TG167269	Medium	Mainly arable fields with pockets of planted woodland.
BACT33	TG237304	Medium	Mainly arable land as was surrounding areas
BACT34	TG360302	Medium	Mainly arable land, with a track and double hedgerow running along the western section of the transect; small stream
BACT35	TF917102	Medium	Mixture of arable land, adjacent blocks of broadleaved woodland and conifer plantation.

Appendix 2: Static locations descriptions

Transect	BA point	Grid reference	Static position
BACT03	BA06	TF 94050 12417	Mature Ash Tree at the end of hedgerow.
BACT03	BA69X	TF 94800 12503	Mature Oak standard, between two arable fields.
BACT04	BA70X	TF 91624 10974	Holly tree within thin deciduous woodland strip.
BACT04	BA71X	TF 91425 10548	End of established hedgerow.
BACT04	BA93X	TF 91241 10801	Medium Oak tree at S corner of deciduous woodland.
BACT05	BA10	TF 97059 14824	Mature Oak along established tree line long road.
BACT05	BA11	TF 97289 15030	Mature Ash at end of established hedgerow.
BACT05	BA95X	TF 96742 14985	Mature Oak along established tree line long road.
BACT08	BA20	TG 03408 16490	Fence post next to mature Oak tree along established hedgerow.
BACT08	BA21	TG 03550 16531	Fence post parallel to fence <i>Salix</i> tree line.
BACT09	BA23	TG 04025 17321	Fence post below line of mature Poplar trees.
BACT09	BA92X	TG 03800 17304	Mature oak outside NE corner of strip of woodland.
BACT09	BA97X	TG 03962 17027	Fence post within gap of established hedgerow.
BACT10	BA24	TG 03958 17632	Mature oak along mature tree line through grazing pasture.
BACT10	BA72X	TG 03803 17569	Large Hawthorn at end of hedgerow at arable field entrance.
BACT10	BA98X	TG 04109 17738	Mature Willow tree standard along the bank of the river Wensum.
BACT13	BA73X	TG 07910 23729	Ivy covered Holly tree, amongst small copse of trees.
BACT13	BA74X	TG 08896 23590	Mature Ash tree on top of disused railway embankment, other nearby trees.
BACT14	BA100X	TG 11897 23791	Fencepost with deer fencing surrounding Christmas tree plantation.
BACT14	BA63X	TG 11616 24210	Medium Beech tree along mixed woodland edge.
BACT14	BA66X	TG 12104 24228	Within established Hawthorn hedgerow within Christmas tree plantation.
BACT15	BA32	TG 20280 29069	Mature Oak on corner of woodland.

Transect	BA point	Grid reference	Static position
BACT15	BA33	TG 20446 28851	<i>End of hedgerow.</i>
BACT16	BA35	TG 21203 29278	Young oak tree along open arable field edge.
BACT16	BA75X	TG 20936 29023	Mature Oak tree standard, surrounded by open arable land.
BACT17	BA36	TG 21826 30308	<i>Mature Oak, field side along road.</i>
BACT17	BA37	TG 21936 30206	Holly tree along well established hedgerow.
BACT17	BA91X	TG 22730 30573	Holly tree on edge of woodland strip.
BACT18	BA43	TG 27047 31731	Young oak tree along open arable field edge.
BACT18	BA44	TG 27367 31887	Mature Ash tree along well established hedgerow.
BACT19	BA55	TG 37014 30872	Large Hawthorn tree surrounded by open arable fields.
BACT19	BA56	TG 36703 30570	Mature tree along short, mature tree line.
BACT20	BA02	TF 89638 10399	Young Horse Chestnut alongside pond edge and established hedgerow.
BACT20	BA03	TF 90225 10470	Young Ash tree along patchy hedgerow.
BACT20	BA04	TF 90595 10221	Medium Oak tree within established hedgerow.
BACT21	BA106X	TG 29645 31559	Mature Willow tree within small copse of willow trees adjacent to Dilham Canal.
BACT21	BA62X	TG 29559 31866	Medium Oak tree within woodland.
BACT21	BA76X	TG 29763 31562	Young Oak within patchy hedgerow.
BACT22	BA107X	TG 32305 31646	Medium tree alongside woodland edge and arable field.
BACT22	BA48	TG 32748 31347	Small gap within established hedgerow.
BACT22	BA60X	TG 31932 31475	Medium tree along woodland edge, adjacent to reservoir and arable field.
BACT24	BA65X	TG 35600 30300	<i>Medium Oak on NE corner of mixed woodland.</i>
BACT26	BA79X	TF 94666 13130	Mature Ash tree, surrounded by open meadow.
BACT26	BA80X	TF 94888 13497	Young Oak tree along hedgerow.
BACT27	BA81X	TF 95794 14308	Mature Oak tree along established hedgerow.

Transect	BA point	Grid reference	Static position
BACT27	BA82X	TF 95726 14763	Mature Oak tree along established hedgerow.
BACT28	BA111X	TF 98582 15988	Trunk of dead tree at end of short tree line.
BACT28	BA13	TF 98418 15408	On trunk of dense Field Maple along well established hedgerow
BACT29	BA25	TG 06192 20259	Mature tree within established Blackthorn hedgerow.
BACT29	BA26	TG 06353 20317	In opening along established Blackthorn hedgerow.
BACT30	BA64X	TG 07785 22996	Crab apple tree amongst scrub along arable field edge.
BACT30	BA87X	TG 07302 23130	Large Hazel coppice within small copse of trees at base of disused railway embankment.
BACT31	BA114X	TG 19628 28557	Dead tree on arable field edge.
BACT31	BA67X	TG 19822 28632	Fence post adjacent to river Bure.
BACT31	BA68X	TG 19313 28758	Medium Hawthorn adjacent to small patch of woodland.
BACT32	BA88X	TG 16539 27154	Mature Sweet Chestnut tree within deciduous woodland.
BACT32	BA89X	TG 16395 26653	Mature Oak tree within established hedgerow.
BACT33	BA40	TG 23607 30424	Medium Oak tree within established Hawthorn hedgerow.
BACT33	BA41	TG 23911 30428	Ivy covered tree at gap in hedgerow.
BACT34	BA52	TG 35947 30027	Mature Ash tree at end of established hedgerow, surrounded by arable fields.
BACT34	BA90X	TG 35894 30426	Mature Oak Tree within established hedgerow and tree line.
BACT35	BA118X	TF 91252 10081	Outside corner of deciduous woodland plantation.
BACT35	BA119X	TF 90017 10766	Outside corner of deciduous woodland plantation.
<i>Non-transect</i>	<i>BA05</i>	<i>TF 93733 11836</i>	<i>Coppice Hazel along hedgerow.</i>
<i>Non-transect</i>	<i>BA38</i>	<i>TG 22219 30417</i>	<i>Medium Ash tree within established hedgerow.</i>
<i>Non-transect</i>	<i>BA39</i>	<i>TG 22467 30444</i>	<i>Within established hedgerow.</i>
<i>Non-transect</i>	<i>BA57</i>	<i>TG 37245 30441</i>	<i>Within established hedgerow.</i>
<i>Non-transect</i>	<i>BA61</i>	<i>TF 91128 09618</i>	<i>Mature Oak along woodland edge.</i>

Appendix 3: Transect survey effort

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT03	JG , JH	03/07/17	21:20	21:20	23:22	16°C	15°C	BWS1	2/8	None
BACT03	JG , JH	04/07/17	04:38	02:30	04:39	10°C	13°C	BWS1	1/8	None
BACT03	JWH, JH	03/08/17	20:43	20:54	21:58	19.5°C	18°C	BWS2	6/8	None
BACT03	KC, JH	01/09/17	19:42	19:45	20:47	13°C	14°C	BWS0	3/8	None
BACT04	BC, CB	20/06/17	21:22	21:28	23:25	18°C	14°C	BWS2	8/8	None
BACT04	BC, CB	21/06/17	21:22	02:30	04:33	16°C	14°C	BWS2	4/8	None
BACT04	BM, KC	03/07/17	21:20	21:20	23:04	16°C	15°C	BWS0	1/8	None
BACT04	JA, CB	03/07/17	21:20	20:28	22:45	16°C	18°C	BWS4	6/8	None
BACT04	KC, JA	14/08/17	20:22	20:16	21:42	17°C	18°C	BWS2	8/8	Rain at start
BACT05	BC, AB	25/05/17	20:59	20:58	21:41	15°C	13°C	BWS1	1/8	None
BACT05	BC, AV	12/06/17	21:18	21:22	23:16	15°C	15°C	BWS1	7/8	None
BACT05	KC, BM	26/06/17	21:22	21:20	22:57	12°C	14°C	BWS0	1/8	None
BACT05	AG, JH	18/07/17	21:07	21:18	22:49	17°C	17°C	BWS0	5/8	None
BACT05	AG, JH	08/08/17	05:25	20:39	21:58	15°C	14°C	BWS2	8/8	Heavy rain 21:24>
BACT05	AG, JH	22/08/17	05:48	20:07	21:28	19°C	17°C	BWS2	6/8	None
BACT05	JH, AG	06/09/17	06:14	19:45	21:17	18°C	15°C	BWS0	5/8	light rain at start
BACT05	JWH, JH	19/09/17	19:00	19:06	20:24	13°C	15°C	BWS0	2/8	None
BACT05	JWH, JH	03/10/17	18:26	18:25	20:17	14°C	12°C	BWS1	8/8	None
BACT05	BC, BM	04/10/17	07:01	05:02	07:07	10°C	10°C	BWS2	7/8	None
BACT05	JWH, JH	17/10/17	17:55	17:58	19:38	15°C	11°C	BWS0	8/8	None
BACT08	KC, LT	22/05/17	20:55	20:30	23:00	18°C	15°C	BWS0	6/8	None

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT08	KC, BH	02/06/17	21:09	21:15	23:44	17.5°C	14°C	BWS0	8/8	None
BACT08	LT, JA	12/06/17	21:18	21:24	23:04	16°C	15°C	BWS2	7/8	None
BACT08	KC, JH	11/07/17	04:44	02:40	04:11	14°C	14°C	BWS0	5/8	None
BACT08	BM, AV	14/07/17	04:48	21:13	23:00	15°C	15°C	BWS0	4/8	None
BACT08	KC, LT	07/08/17	20:36	20:42	22:22	18.9°C	17°C	BWS0	7/8	None
BACT08	KC, JH	04/09/17	19:35	19:36	21:03	18°C	18°C	BWS0	3/8	None
BACT08	KC, JH	12/09/17	06:24	19:12	20:28	15°C	15°C	BWS3	4/8	Light rain
BACT08	LT, KC	02/10/17	06:57	18:36	20:08	15°C	14°C	BWS3	5/8	None
BACT09	BM, JA	10/05/17	20:37	20:30	22:20	8°C	5°C	BWS2	1/8	None
BACT09	RM	13/06/17	21:19	21:20	23:22	17°C	15°C	BWS0	5/8	None
BACT09	JA, PK-W	29/06/17	21:21	21:08	23:22	16°C	13°C	BWS1	6/8	None
BACT09	AG, BM	13/07/17	21:13	21:17	22:42	15°C	15°C	BWS0	8/8	Rain/drizzle - 21:50 - 22:02
BACT09	BM, JWH	27/07/17	20:55	20:56	23:05	15°C	13°C	BWS0	4/8	Dry, misty at northern end
BACT09	AG, JH	29/08/17	19:49	19:52	21:08	16°C	16°C	BWS4	8/8	None
BACT09	AG, JH	12/09/17	19:16	19:17	20:25	12°C	12°C	BWS4	8/8	Light rain 19:40-19:58
BACT09	AG, JH	26/09/17	18:43	18:45	20:03	17°C	14°C	BWS1	1/8	None
BACT09	AG, BB	27/09/17	06:49	05:24	06:40	11°C	9°C	BWS0	8/8 - Fog	None
BACT09	AG, JH	10/10/17	18:10	18:13	19:55	14°C	14°C	BWS1	6/8	None
BACT09	BM, JH	24/10/17	17:40	17:41	19:16	17°C	18°C	BWS2	8/8	None
BACT 10	BC	10/05/17	20:37	20:45	22:15	12°C	6°C	BWS1	0/8	None
BACT10	BM, JH	07/07/17	21:18	21:18	22:45	19°C	18°C	BWS0	7/8	None
BACT10	KC, JH	17/07/17	21:08	21:10	22:54	17°C	15°C	BWS0	1/8	None

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT10	KC, JH	18/07/17	04:53	02:45	04:15	13°C	12°C	BWS0	1/8	None - mist
BACT10	KC, AV	04/08/17	20:41	20:45	22:04	19°C	17°C	BWS1	4/8	None
BACT10	KC, AV	25/08/17	19:58	20:06	21:18	19°C	17°C	BWS0	2/8	None
BACT10	KC, JH	22/09/17	18:53	19	19:52	15°C	14°C	BWS0	2/8	02-Aug
BACT10	BM, CB	27/09/17	18:41	18:40	20:02	15°C	16°C	BWS2	4/8	None
BACT10	KC, BM	06/10/17	07:04	18:19	20:09	11°C	9°C	BWS1	5/8	05-Aug
BACT10	KC, BM	20/10/17	17:48	17:49	19:24	14°C	13°C	BWS2	8/8	08-Aug
BACT13	SM, RE	26/05/17	21:08	21:08	22:52	21°C	15°C	BWS1	0/8	None
BACT13	JG, BM	19/06/17	21:18	21:49	23:50	22.9°C	20°C	BWS1	2/8	None
BACT04	BC, CB	21/06/17	21:22	02:30	04:33	16°C	14°C	BWS2	4/8	None
BACT13	KC, JH	18/08/17	20:13	20:45	22:13	17°C	14°C	BWS2	0/8	None
BACT13	KC, JH	19/08/17	05:43	04:15	05:38	10°C	10°C	BWS2	0/8	None
BACT13	LT, KC	18/09/17	19:02	19:02	20:36	14°C	11°C	BWS0	2/8	None
BACT13	BM, CB	31/10/17	16:26	16:25	18:21	12°C	12°C	BWS3	3/8	None
BACT14	AG, BM	08/06/17	21:15	21:15	23:03	18°C	15°C	BWS0	7/8	None
BACT14	AG, BM	22/06/2017	21:22	21:21	22:51	17°C	17°C	BWS0	3/8	None
BACT14	AG, JH	06/07/2017	21:18	21:20	22:55	20°C	18°C	BWS1	3/8	None
BACT14	AG, AV	27/07/17	20:55	20:58	22:34	15°C	14°C	BWS2	5/8	Rain prior
BACT14	AG, JH	10/08/17	20:30	20:31	21:55	14°C	12°C	BWS1	2/8	None
BACT14	AG, JH	31/08/17	06:04	19:43	21:10	14°C	13°C	BWS2	6/8	None
BACT14	AG, BM	14/09/17	19:12	19:17	20:35	12°C	11°C	BWS0	6/8	Rain 20:24>
BACT14	AG, BM	15/09/17	06:29	04:35	05:54	8°C	6°C	BWS0	0/8	None

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT14	AC, BM	28/09/17	18:38	18:37	19:59	18°C	15°C	BWS0	3/8	None
BACT14	AB, BM	12/10/17	18:06	18:08	20:15	15°C	11°C	BWS1	4/8	None
BACT14	BM, CB	26/10/17	17:36	17:39	19:25	14°C	12°C	BWS0	5/8	None
BACT 15	BC, JH	07/06/17	21:14	21:10	22:47	16°C	13°C	BWS2	7/8	Light rain from 22:15
BACT16	AG, AV	04/07/17	21:20	21:21	22:46	19°C	18°C	BWS1	6/8	None
BACT16	JWH, AV	02/08/17	20:45	20:45	22:08	17°C	18°C	BWS2	8/8	Slight drizzle
BACT16	AG, JH	15/08/17	05:37	20:23	21:47	18°C	16°C	BWS1	2/8	None
BACT16	AG, JH	07/09/17	19:28	19:32	20:30	16°C	15°C	BWS3	8/8	Rain
BACT16	JG, JH	06/10/17	07:04	05:04	07	10°C	8°C	BWS3	4/8	None
BACT16	AG, JH	05/10/17	07:03	18:24	20:20	14°C	12°C	BWS2	3/8	None
BACT17	BB, BM	30/05/17	21:06	20:57	23:12	15°C	14°C	BWS1	1/8	None
BACT17	KC, JH	23/06/17	21:22	21:23	23:30	19°C	18°C	BWS2	6/8	None
BACT17	JWH, BM	24/07/17	20:59	21	22:29	15°C	15°C	BWS2	8/8	Heavy drizzle before survey and from 21:30
BACT17	JG, BM	14/08/17	20:22	20:22	22	17°C	15°C	BWS3	4/8	None
BACT17	JG, BM	11/09/17	06:22	19:23	21	15°C	13°C	BWS4	7/8	None
BACT17	JG, BM	12/09/17	06:24	04:20	06:36	10°C	10°C	BWS2	1/8	None
BACT17	JG, BM	09/10/17	18:13	18:20	20:30	12°C	12°C	BWS0	8/8	None
BACT18	BM, GH	24/05/17	20:58	20:58	23:21	18°C	15°C	BWS0	0/8	None
BACT18	AG, BM	01/06/17	21:08	21:08	23:10	15°C	15°C	BWS0	4/8	None
BACT18	GH, JH	12/07/17	21:15	21:14	22:53	14°C	11°C	BWS0	0/8	None
BACT18	RM	16/08/17	20:18	20:20	21:20	18°C	18°C	BWS2	3/8	None
BACT18	GH, JH	20/09/17	18:57	19:00	20:03	17°C	16°C	BWS0	8/8	None

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT18	BM, JWH	21/09/17	18:55	04:30	06:44	13°C	14°C	BWS2	7/8	None
BACT18	JWH, BM	23/10/17	17:42	17:40	19:30	14°C	13°C	BWS0	8/8	None
BACT19	BM, JH	09/06/17	21:16	21:15	22:50	15°C	14°C	BWS0	4/8	None
BACT19	GH, JH	25/06/17	21:22	21:20	22:55	16.5°C	16°C	BWS1	7/8	None
BACT19	GH, BM	05/07/17	21:19	21:19	23:01	17°C	15°C	BWS0	0/8	Misty
BACT19	GH, MP	16/08/17	20:18	20:20	21:34	18°C	18°C	BWS3	0/8	None
BACT19	GH, BM	06/09/17	06:14	19:31	20:51	16°C	15°C	BWS3	7/8	None
BACT19	JWH, CB	07/09/17	06:15	04:15	05:40	14°C	11°C	BWS1	6/8	None
BACT19	GH, MP	18/10/17	17:52	18:20	20:05	14°C	14°C	BWS4	8/8	Drizzle (start and end)
BACT 20	JG, BC	15/05/17	20:45	20:46	23:29	15°C	12°C	BWS4	8/8	Drizzle at start
BACT20	JA, JH	30/05/17	21:06	21:15	23:20	19°C	15°C	BWS2	8/8	None
BACT20	JG, BM	26/06/17	21:22	21:25	23:45	14.5°C	12.6°C	BWS3	8/8	None
BACT20	BC, LT	12/07/17	21:15	21:14	23	15°C	12°C	BWS0	1/8	None
BACT20	BC, LT	13/07/17	04:47	02:56	03:52	10°C	8.7°C	BWS0	1/8	None
BACT20	JG, BM	31/07/17	20:48	20:30	23:30	17°C	16°C	BWS1	8/8	Drizzle at start
BACT20	JG, LT	21/08/17	05:45	20:08	22:15	17°C	16°C	BWS1	8/8	None
BACT21	JG, JH	22/05/17	20:55	20:50	23:09	16°C	15°C	BWS2	2/8	None
BACT21	BM, JH	31/05/17	21:07	21:07	23	13°C	12°C	BWS0	0/8	None
BACT21	RM, JH	19/06/17	21:18	22:44	23:27	27°C	20°C	BWS2	5/8	None
BACT21	AG, JH	29/06/17	21:21	21:21	23:11	17°C	13°C	BWS1	7/8	None
BACT21	JWH, JH	31/07/17	20:48	20:50	22:35	19°C	17°C	BWS0	6/8	Light rain at end
BACT21	JG, JH	07/08/17	20:36	20:47	23:00	15°C	16°C	BWS1	8/8	None

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT21	JWH, AV	30/08/17	19:47	19:50	20:47	18°C	12°C	BWS0	8/8	Drizzle
BACT21	JG, BM	04/09/17	19:35	19:36	22	17°C	15°C	BWS0	0/8	None
BACT21	JG, JH	18/09/17	19:02	19:06	21:05	13°C	11°C	BWS3	6/8	None
BACT21	JG, JWH	19/09/17	06:35	04:49	06:35	10°C	11°C	BWS3	8/8	AT Start. Called off until 05.19
BACT21	BM, CB	03/10/17	18:26	18:21	20:24	12°C	12°C	BWS0	8/8	None
BACT21	BM, CB	17/10/17	17:55	17:54	19:53	14°C	13°C	BWS1	8/8	Light rain, 18:17 for 10 minutes
BACT22	BM, CS	22/05/17	20:55	21:19	23:06	16°C	15°C	BWS1	1/8	None
BACT22	AG , BM	15/06/17	21:20	21:20	22:52	18°C	17°C	BWS1	3/8	None
BACT22	JWH, CB	22/08/17	05:48	20:05	21:45	19°C	16°C	BWS1	8/8	None
BACT22	JWH, CB	23/08/17	05:50	03:54	05:40	19°C	17°C	BWS2	8/8	None
BACT22	JWH, CB	29/08/17	19:49	19:49	21:29	16°C	16°C	BWS2	8/8	None
BACT22	JWH, CB	12/09/17	06:24	19:17	20:41	19°C	15°C	BWS1	7/8	None
BACT22	JWH , CB	26/09/17	18:43	18:42	20:12	15°C	13°C	BWS0	0/8	None
BACT22	JWH, CB	10/10/17	18:10	18:12	20:11	16°C	15°C	BWS3	2/8	None
BACT22	JWH, BB	24/10/17	17:40	17:50	19:35	18°C	17°C	BWS2	7/8	None
BACT26	BM, JH	20/06/17	21:22	21:20	23:31	15°C	14°C	BWS3	1/8	None
BACT26	BM, JH	21/06/17	21:22	02:30	04:11	14°C	14°C	BWS1	0/8	None
BACT26	KC, AV	31/07/17	20:48	20:55	22:17	18°C	17°C	BWS0	4/8	Drizzle first 10 minutes
BACT26	BM, AV	08/08/17	05:25	20:34	21:48	16°C	14°C	BWS3	6/8	Rain started at 21:36
BACT26	BM, JWH	21/09/17	18:55	19:05	20:04	16°C	16°C	BWS3	8/8	Light rain
BACT26	BM, CB	05/10/17	07:03	18:22	19:35	13°C	10°C	BWS2	5/8	Rain showers - getting heavier/longer
BACT27	BC, JH	13/06/17	21:19	21:19	23:25	17°C	15°C	BWS0	3/8	None

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT27	SM, RE	03/07/17	21:20	21:23	23:11	14°C	15°C	BWS0	6/8	None
BACT27	GH, MP	30/08/17	19:47	20:04	21:10	18°C	12°C	BWS0	4/8	Heavy rain prior
BACT27	JWH, JH	08/09/17	19:26	19:30	20:38	19°C	12°C	BWS0	1/8	Rain prior
BACT27	JWH, JH	09/09/17	06:19	05:00	06:00	10°C	9°C	BWS0	8/8	None
BACT27	JWH, JH	13/10/17	18:04	18:04	19:49	19°C	17°C	BWS3	1/8	None
BACT28	JA, NT	21/06/17	21:22	21:18	23:20	22°C	21°C	BWS2	6/8	None
BACT28	BC, CB	29/06/17	21:21	21:20	23:25	15°C	13°C	BWS1	3/8	None
BACT28	GH, MP	19/07/17	04:45	21:06	22:37	21°C	21°C	BWS2	8/8	None
BACT28	JG, MP	23/08/17	20:03	20:18	21:58	19°C	18°C	BWS1	6/8	None
BACT28	GH, JH	13/09/17	19:14	19:21	20:31	11°C	10°C	BWS2	7/8	None
BACT28	JWH, GH	14/09/17	06:27	05:08	06:20	8°C	9°C	BWS1	0/8	None
BACT28	GH, JH	11/10/17	18:08	18:30	19:52	16.5°C	15.5°C	BWS2	7/8	V. light Speckles
BACT29	BM, BB	04/07/17	21:20	21:20	23:11	18oC	18oC	BWS0	7/8	None
BACT29	KC, BM	11/08/17	05:30	20:23	21:25	16oC	17oC	BWS0	7/8	None
BACT29	BM, AV	04/09/17	19:35	19:36	21:30	13oc	18oc	BWS0	5/8	None
BACT29	BM, AV	05/09/17	06:12	04:15	06:03	15OC	17OC	BWS0	8/8	None
BACT29	JG, CB	02/10/17	06:57	18:31	20:34	14OC	13OC	BWS4	8/8	None
BACT29	JG, CB	30/08/17	19:47	19:48	21:35	12OC	11OC	BWS1	1/8	Drizzle at start
BACT30	BM, KC	26/05/17	21:06	21:04	22:59	17oC	15oC	BWS2	0/8	None
BACT30	SM, MP	29/06/17	21:21	21:24	23:31	13°C	13°C	BWS3	8/8	Drizzle for first 10 minutes then dry.
BACT30	CB, AV	25/07/17	20:58	20:58	22:40	16oC	13oC	BWS0	0/8	None
BACT30	BM, AV	22/08/17	05:48	20:05	22:01	17OC	16OC	BWS1	6/8	None

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT30	BM, CB	19/09/17	19:00	19:12	20:25	16OC	10OC	BWS0	0/8	None
BACT30	BM, CB	20/09/17	06:37	03:52	06:02	6OC	6OC	BWS0	0/8	None
BACT30	BM, CB	19/10/17	17:50	17:49	18:51	16OC	15OC	BWS3	8/8	None
BACT31	KC, BM	12/06/17	21:18	21:18	23:18	16.1°C	13°C	BWS1	7/8	None
BACT31	RM, AV	26/06/17	21:22	21:24	22:28	13°C	11°C	BWS1	3/8	None
BACT31	BM, AV	12/07/17	21:15	21:15	23:18	12°C	12°C	BWS0	1/8	Misty
BACT31	BM, AV	26/07/17	20:56	20:56	22:58	18°C	17°C	BWS3	6/8	None
BACT31	BM, AV	23/08/17	20:03	20:03	21:54	17°C	18°C	BWS0	8/8	None
BACT31	JWH, BM	31/08/17	06:04	20:52	21:56	13°C	13°C	BWS0	2/8	None
BACT31	JWH, BM	01/09/17	06:05	04:02	05:45	11°C	8°C	BWS0	0/8	None
BACT31	KC, JH	15/09/17	19:09	19:41	20:37	13°C	12°C	BWS0	2/8	None
BACT31	KC, CB	09/10/17	18:13	18:12	20:19	13°C	12°C	BWS3	4/8	None
BACT31	BM, ML	25/10/17	17:38	17:32	19:35	15°C	14°C	BWS1	7/8	None
BACT32	BC, JH	15/06/17	21:20	21:24	23:07	18°C	17°C	BWS1	4/8	None
BACT32	JA, CB	12/07/17	21:15	21:06	23:03	24°C	11°C	BWS1	1/8	None
BACT32	RM, CB	15/08/17	05:37	20:23	22:39	15°C	14°C	BWS0	1/8	None
BACT32	JWH, BM	16/08/17	05:38	03:47	05:55	12°C	10°C	BWS0	0/8	None
BACT32	JWH, BB	19/09/17	19:00	19:02	20:13	12°C	10°C	BWS2	2/8	None
BACT33	JA, CB	14/06/17	21:19	21:12	23:05	17°C	15°C	BWS1	1/8	None
BACT33	KC, BM	21/07/17	21:03	21:03	22:30	18°C	18°C	BWS1	2/8	None
BACT33	AG, BM	24/08/17	20:07	20:14	21:34	17°C	15°C	BWS1	2/8	None
BACT33	AG, BM	25/08/17	19:58	03:50	05:15	10°C	10°C	BWS0	1/8	None

Transect	Surveyor	Date	Sunrise/Sunset	Start	End	Start	End	Wind	Cloud cover	Precipitation
						Temp	Temp			
BACT33	KC, BM	29/09/17	18:36	18:35	19:54	16°C	15°C	BWS0	7/8	None
BACT34	BC, AV	30/06/17	21:21	21:25	21:59	12°C	15°C	BWS4	8/8	None
BACT34	RB, JH	05/07/17	21:19	21:35	23:01	17°C	15°C	BWS0	0/8	None
BACT34	CB, JWH	17/08/17	05:30	20:16	21:50	18°C	17°C	BWS2	0/8	None
BACT34	BB, JA	12/09/17	06:24	19:40	20:33	13°C	13°C	BWS2	0/8	Rain at 20:00, 5 minutes
BACT34	JG, BM	10/10/17	18:19	18:10	20:25	13°C	13°C	BWS4	2/8	None
BACT34	JG, BM	11/10/17	07:13	05:04	07:06	15°C	15°C	BWS1	8/8	None
BACT35	JWH	30/07/17	21:20	21	22:36	14°C	13°C	BWS1	7/8	None

Appendix 4 : Details of static deployments

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA02	BACT20	09/05/2017	25/05/2017	16
BA02	BACT20	30/05/2017	05/06/2017	6
BA02	BACT20	26/06/2017	05/07/2017	9
BA02	BACT20	12/07/2017	17/07/2017	5
BA02	BACT20	31/07/2017	17/08/2017	17
BA02	BACT20	21/08/2017	28/08/2017	7
BA03	BACT20	09/05/2017	25/05/2017	16
BA03	BACT20	26/06/2017	05/07/2017	9
BA03	BACT20	04/07/2017	17/07/2017	13
BA03	BACT20	31/07/2017	17/08/2017	17
BA03	BACT20	21/08/2017	28/08/2017	7
BA04	BACT20	09/05/2017	25/05/2017	16
BA04	BACT20	26/06/2017	10/07/2017	14
BA04	BACT20	13/07/2017	17/07/2017	4
BA04	BACT20	31/07/2017	17/08/2017	17
BA05	External	28/04/2017	19/05/2017	21
BA06	BACT03	04/07/2017	07/07/2017	3
BA06	BACT03	03/08/2017	07/08/2017	4
BA06	BACT03	01/09/2017	07/09/2017	6
BA06	BACT03	26/10/2017	31/10/2017	5
BA10	BACT05	25/05/2017	01/06/2017	7
BA10	BACT05	12/06/2017	19/06/2017	7

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA10	BACT05	26/06/2017	30/06/2017	4
BA10	BACT05	18/07/2017	21/07/2017	3
BA10	BACT05	08/08/2017	14/08/2017	6
BA10	BACT05	31/08/2017	04/09/2017	4
BA10	BACT05	03/10/2017	08/10/2017	5
BA100X	BACT14	22/06/2017	27/06/2017	5
BA100X	BACT14	27/07/2017	01/08/2017	5
BA100X	BACT14	31/08/2017	06/09/2017	6
BA100X	BACT14	28/09/2017	03/10/2017	5
BA100X	BACT14	12/10/2017	17/10/2017	5
BA106X	BACT21	19/06/2017	26/06/2017	7
BA106X	BACT21	31/07/2017	07/08/2017	7
BA106X	BACT21	07/08/2017	14/08/2017	7
BA106X	BACT21	04/09/2017	13/09/2017	9
BA106X	BACT21	17/10/2017	21/10/2017	4
BA107X	BACT22	22/08/2017	25/08/2017	3
BA107X	BACT22	12/09/2017	20/09/2017	8
BA107X	BACT22	24/10/2017	30/10/2017	6
BA11	BACT05	25/05/2017	01/06/2017	7
BA11	BACT05	12/06/2017	19/06/2017	7
BA11	BACT05	22/08/2017	28/08/2017	6
BA11	BACT05	19/09/2017	26/09/2017	7
BA11	BACT05	17/10/2017	23/10/2017	6

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA111X	BACT28	22/06/2017	23/06/2017	1
BA111X	BACT28	29/06/2017	03/07/2017	4
BA111X	BACT28	19/07/2017	24/07/2017	5
BA111X	BACT28	23/08/2017	28/08/2017	5
BA111X	BACT28	13/09/2017	18/09/2017	5
BA111X	BACT28	11/10/2017	16/10/2017	5
BA114X	BACT31	26/06/2017	30/06/2017	4
BA114X	BACT31	12/07/2017	17/07/2017	5
BA114X	BACT31	26/07/2017	03/08/2017	8
BA114X	BACT31	01/09/2017	06/09/2017	5
BA114X	BACT31	25/10/2017	30/10/2017	5
BA118X	BACT35	30/07/2017	08/08/2017	9
BA119X	BACT35	30/07/2017	08/08/2017	9
BA13	BACT28	21/06/2017	27/06/2017	6
BA13	BACT28	19/07/2017	24/07/2017	5
BA13	BACT28	22/08/2017	28/08/2017	6
BA13	BACT28	14/09/2017	19/09/2017	5
BA13	BACT28	11/10/2017	16/10/2017	5
BA20	BACT08	02/06/2017	12/06/2017	10
BA20	BACT08	12/06/2017	20/06/2017	8
BA20	BACT08	14/07/2017	27/07/2017	13
BA20	BACT08	07/08/2017	08/08/2017	1
BA20	BACT08	04/09/2017	12/09/2017	8

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA20	BACT08	02/10/2017	11/10/2017	9
BA21	BACT08	02/06/2017	12/06/2017	10
BA21	BACT08	12/06/2017	20/06/2017	8
BA21	BACT08	11/07/2017	17/07/2017	6
BA21	BACT08	04/09/2017	12/09/2017	8
BA21	BACT08	02/10/2017	11/10/2017	9
BA23	BACT09	09/05/2017	19/05/2017	10
BA23	BACT09	14/06/2017	19/06/2017	5
BA23	BACT09	13/07/2017	18/07/2017	5
BA23	BACT09	27/07/2017	31/07/2017	4
BA23	BACT09	29/08/2017	04/09/2017	6
BA23	BACT09	27/09/2017	02/10/2017	5
BA23	BACT09	24/10/2017	31/10/2017	7
BA24	BACT10	10/05/2017	19/05/2017	9
BA24	BACT10	07/07/2017	12/07/2017	5
BA24	BACT10	17/07/2017	24/07/2017	7
BA24	BACT10	25/08/2017	31/08/2017	6
BA24	BACT10	27/09/2017	02/10/2017	5
BA24	BACT10	06/10/2017	11/10/2017	5
BA25	BACT29	04/07/2017	10/07/2017	6
BA25	BACT29	11/08/2017	15/08/2017	4
BA25	BACT29	30/08/2017	04/09/2017	5
BA25	BACT29	05/09/2017	12/09/2017	7

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA25	BACT29	02/10/2017	06/10/2017	4
BA26	BACT29	04/07/2017	05/07/2017	1
BA26	BACT29	11/08/2017	16/08/2017	5
BA26	BACT29	30/08/2017	04/09/2017	5
BA26	BACT29	04/09/2017	12/09/2017	8
BA26	BACT29	02/10/2017	09/10/2017	7
BA32	BACT15	07/06/2017	12/06/2017	5
BA33	BACT15	07/06/2017	12/06/2017	5
BA35	BACT16	04/07/2017	10/07/2017	6
BA35	BACT16	02/08/2017	08/08/2017	6
BA35	BACT16	15/08/2017	22/08/2017	7
BA35	BACT16	08/09/2017	11/09/2017	3
BA35	BACT16	05/10/2017	10/10/2017	5
BA36	BACT17	22/05/2017	30/05/2017	8
BA37	BACT17	22/05/2017	30/05/2017	8
BA37	BACT17	23/06/2017	27/06/2017	4
BA37	BACT17	14/08/2017	14/08/2017	0
BA37	BACT17	11/09/2017	19/09/2017	8
BA37	BACT17	09/10/2017	16/10/2017	7
BA38	BACT17	24/07/2017	28/07/2017	4
BA38	BACT17	22/05/2017	30/05/2017	8
BA39	External	22/05/2017	30/05/2017	8
BA40	BACT33	14/06/2017	19/06/2017	5

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA40	BACT33	21/07/2017	26/07/2017	5
BA40	BACT33	24/08/2017	30/08/2017	6
BA40	BACT33	29/09/2017	04/10/2017	5
BA40	BACT33	23/10/2017	30/10/2017	7
BA41	BACT33	14/06/2017	19/06/2017	5
BA41	BACT33	21/07/2017	26/07/2017	5
BA41	BACT33	25/08/2017	30/08/2017	5
BA41	BACT33	29/09/2017	04/10/2017	5
BA41	BACT33	23/10/2017	30/10/2017	7
BA43	BACT18	22/05/2017	30/05/2017	8
BA43	BACT18	01/06/2017	06/06/2017	5
BA43	BACT18	12/07/2017	17/07/2017	5
BA43	BACT18	16/08/2017	21/08/2017	5
BA43	BACT18	21/09/2017	25/09/2017	4
BA43	BACT18	23/10/2017	29/10/2017	6
BA44	BACT18	22/05/2017	30/05/2017	8
BA44	BACT18	01/06/2017	06/06/2017	5
BA44	BACT18	12/07/2017	17/07/2017	5
BA44	BACT18	16/08/2017	21/08/2017	5
BA44	BACT18	21/09/2017	26/09/2017	5
BA44	BACT18	23/10/2017	30/10/2017	7
BA48	BACT22	30/05/2017	06/06/2017	7
BA48	BACT22	15/06/2017	20/06/2017	5

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA48	BACT22	23/08/2017	29/08/2017	6
BA48	BACT22	12/09/2017	20/09/2017	8
BA48	BACT22	24/10/2017	30/10/2017	6
BA52	BACT34	07/06/2017	13/06/2017	6
BA52	BACT34	30/06/2017	05/07/2017	5
BA52	BACT34	05/07/2017	11/07/2017	6
BA52	BACT34	17/08/2017	24/08/2017	7
BA52	BACT34	18/09/2017	25/09/2017	7
BA52	BACT34	10/10/2017	10/10/2017	0
BA55	BACT19	09/06/2017	14/06/2017	5
BA55	BACT19	25/06/2017	29/06/2017	4
BA55	BACT19	05/07/2017	11/07/2017	6
BA55	BACT19	07/09/2017	12/09/2017	5
BA55	BACT19	18/10/2017	23/10/2017	5
BA56	BACT19	09/06/2017	14/06/2017	5
BA56	BACT19	25/06/2017	29/06/2017	4
BA56	BACT19	05/07/2017	11/07/2017	6
BA56	BACT19	21/08/2017	30/08/2017	9
BA56	BACT19	18/10/2017	23/10/2017	5
BA57	External	09/06/2017	14/06/2017	5
BA60X	BACT22	16/05/2017	25/05/2017	9
BA60X	BACT22	29/08/2017	05/09/2017	7
BA60X	BACT22	26/09/2017	02/10/2017	6

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA60X	BACT22	10/10/2017	16/10/2017	6
BA61X	External	22/05/2017	06/06/2017	15
BA61X	External	15/06/2017	20/06/2017	5
BA62X	BACT21	22/05/2017	30/05/2017	8
BA62X	BACT21	31/05/2017	06/06/2017	6
BA62X	BACT21	19/06/2017	26/06/2017	7
BA62X	BACT21	29/06/2017	05/07/2017	6
BA62X	BACT21	31/07/2017	07/08/2017	7
BA62X	BACT21	30/08/2017	04/09/2017	5
BA62X	BACT21	04/09/2017	13/09/2017	9
BA62X	BACT21	03/10/2017	08/10/2017	5
BA63X	BACT14	24/05/2017	30/05/2017	6
BA63X	BACT14	08/06/2017	13/06/2017	5
BA63X	BACT14	27/07/2017	01/08/2017	5
BA63X	BACT14	10/08/2017	15/08/2017	5
BA63X	BACT14	15/09/2017	20/09/2017	5
BA63X	BACT14	26/10/2017	31/10/2017	5
BA64X	BACT30	26/05/2017	06/06/2017	11
BA64X	BACT30	28/06/2017	04/07/2017	6
BA64X	BACT30	27/07/2017	31/07/2017	4
BA64X	BACT30	25/08/2017	30/08/2017	5
BA64X	BACT30	20/09/2017	25/09/2017	5
BA64X	BACT30	19/10/2017	24/10/2017	5

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA65X	BACT24	07/06/2017	13/06/2017	6
BA66X	BACT14	08/06/2017	13/06/2017	5
BA66X	BACT14	22/06/2017	28/06/2017	6
BA66X	BACT14	06/07/2017	11/07/2017	5
BA66X	BACT14	27/07/2017	01/08/2017	5
BA66X	BACT14	10/08/2017	15/08/2017	5
BA66X	BACT14	14/09/2017	20/09/2017	6
BA66X	BACT14	12/10/2017	18/10/2017	6
BA67X	BACT31	12/06/2017	19/06/2017	7
BA67X	BACT31	26/06/2017	30/06/2017	4
BA67X	BACT31	12/07/2017	17/07/2017	5
BA67X	BACT31	26/07/2017	03/08/2017	8
BA67X	BACT31	31/08/2017	06/09/2017	6
BA67X	BACT31	09/10/2017	17/10/2017	8
BA68X	BACT31	12/06/2017	19/06/2017	7
BA68X	BACT31	26/06/2017	30/06/2017	4
BA68X	BACT31	12/07/2017	17/07/2017	5
BA68X	BACT31	26/07/2017	03/08/2017	8
BA68X	BACT31	23/08/2017	29/08/2017	6
BA68X	BACT31	15/09/2017	25/09/2017	10
BA68X	BACT31	09/10/2017	17/10/2017	8
BA69X	BACT03	04/07/2017	07/07/2017	3
BA69X	BACT03	03/08/2017	07/08/2017	4

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA69X	BACT03	01/09/2017	07/09/2017	6
BA69X	BACT03	18/10/2017	24/10/2017	6
BA70X	BACT04	20/06/2017	26/06/2017	6
BA70X	BACT04	03/07/2017	07/07/2017	4
BA70X	BACT04	03/08/2017	09/08/2017	6
BA71X	BACT04	21/06/2017	26/06/2017	5
BA71X	BACT04	03/08/2017	09/08/2017	6
BA71X	BACT04	14/08/2017	22/08/2017	8
BA72X	BACT10	07/07/2017	12/07/2017	5
BA72X	BACT10	18/07/2017	24/07/2017	6
BA72X	BACT10	25/08/2017	31/08/2017	6
BA72X	BACT10	27/09/2017	02/10/2017	5
BA72X	BACT10	06/10/2017	11/10/2017	5
BA73X	BACT13	19/06/2017	23/06/2017	4
BA73X	BACT13	19/08/2017	24/08/2017	5
BA73X	BACT13	18/09/2017	25/09/2017	7
BA73X	BACT13	24/10/2017	30/10/2017	6
BA74X	BACT13	19/06/2017	23/06/2017	4
BA74X	BACT13	29/08/2017	04/09/2017	6
BA74X	BACT13	18/09/2017	25/09/2017	7
BA74X	BACT13	24/10/2017	30/10/2017	6
BA75X	BACT16	04/07/2017	10/07/2017	6
BA75X	BACT16	02/08/2017	08/08/2017	6

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA75X	BACT16	07/08/2017	15/08/2017	8
BA75X	BACT16	08/09/2017	11/09/2017	3
BA75X	BACT16	06/10/2017	10/10/2017	4
BA76X	BACT21	19/06/2017	26/06/2017	7
BA76X	BACT21	07/08/2017	13/08/2017	6
BA76X	BACT21	17/10/2017	23/10/2017	6
BA79X	BACT26	20/06/2017	26/06/2017	6
BA79X	BACT26	31/07/2017	01/08/2017	1
BA79X	BACT26	08/08/2017	16/08/2017	8
BA79X	BACT26	21/09/2017	26/09/2017	5
BA79X	BACT26	05/10/2017	11/10/2017	6
BA80X	BACT26	20/06/2017	26/06/2017	6
BA80X	BACT26	31/07/2017	03/08/2017	3
BA80X	BACT26	08/08/2017	10/08/2017	2
BA80X	BACT26	21/09/2017	26/09/2017	5
BA80X	BACT26	05/10/2017	11/10/2017	6
BA81X	BACT27	13/06/2017	19/06/2017	6
BA81X	BACT27	03/07/2017	07/07/2017	4
BA81X	BACT27	30/08/2017	12/09/2017	13
BA81X	BACT27	13/10/2017	18/10/2017	5
BA82X	BACT27	13/06/2017	19/06/2017	6
BA82X	BACT27	03/07/2017	07/07/2017	4
BA82X	BACT27	30/08/2017	01/09/2017	2

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA82X	BACT27	13/10/2017	18/10/2017	5
BA87X	BACT30	28/06/2017	04/07/2017	6
BA87X	BACT30	25/07/2017	31/07/2017	6
BA87X	BACT30	22/08/2017	29/08/2017	7
BA87X	BACT30	19/09/2017	25/09/2017	6
BA87X	BACT30	19/10/2017	24/10/2017	5
BA88X	BACT32	15/06/2017	23/06/2017	8
BA88X	BACT32	12/07/2017	17/07/2017	5
BA88X	BACT32	16/08/2017	21/08/2017	5
BA88X	BACT32	19/09/2017	25/09/2017	6
BA88X	BACT32	16/10/2017	23/10/2017	7
BA89X	BACT32	15/06/2017	23/06/2017	8
BA89X	BACT32	12/07/2017	17/07/2017	5
BA89X	BACT32	15/08/2017	21/08/2017	6
BA89X	BACT32	19/09/2017	26/09/2017	7
BA89X	BACT32	16/10/2017	23/10/2017	7
BA90X	BACT34	30/06/2017	05/07/2017	5
BA90X	BACT34	05/07/2017	11/07/2017	6
BA90X	BACT34	21/08/2017	24/08/2017	3
BA90X	BACT34	12/09/2017	12/09/2017	0
BA90X	BACT34	11/10/2017	16/10/2017	5
BA91X	BACT17	23/06/2017	27/06/2017	4
BA91X	BACT17	24/07/2017	28/07/2017	4

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA91X	BACT17	14/08/2017	21/08/2017	7
BA91X	BACT17	11/09/2017	19/09/2017	8
BA91X	BACT17	09/10/2017	16/10/2017	7
BA92X	BACT09	14/06/2017	19/06/2017	5
BA92X	BACT09	29/06/2017	03/07/2017	4
BA92X	BACT09	13/07/2017	17/07/2017	4
BA92X	BACT09	27/07/2017	31/07/2017	4
BA92X	BACT09	29/08/2017	04/09/2017	6
BA92X	BACT09	27/09/2017	29/09/2017	2
BA92X	BACT09	10/10/2017	19/10/2017	9
BA93X	BACT04	21/06/2017	23/06/2017	2
BA93X	BACT04	03/07/2017	07/07/2017	4
BA93X	BACT04	03/08/2017	09/08/2017	6
BA93X	BACT04	14/08/2017	22/08/2017	8
BA95X	BACT05	26/06/2017	30/06/2017	4
BA95X	BACT05	08/08/2017	13/08/2017	5
BA95X	BACT05	19/09/2017	23/09/2017	4
BA95X	BACT05	17/10/2017	23/10/2017	6
BA97X	BACT09	13/07/2017	17/07/2017	4
BA97X	BACT09	27/07/2017	31/07/2017	4
BA97X	BACT09	29/08/2017	04/09/2017	6
BA97X	BACT09	24/10/2017	29/10/2017	5
BA98X	BACT10	07/07/2017	12/07/2017	5

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA98X	BACT10	17/07/2017	24/07/2017	7
BA98X	BACT10	25/08/2017	31/08/2017	6
BA98X	BACT10	27/09/2017	02/10/2017	5
BA98X	BACT10	06/10/2017	11/10/2017	5

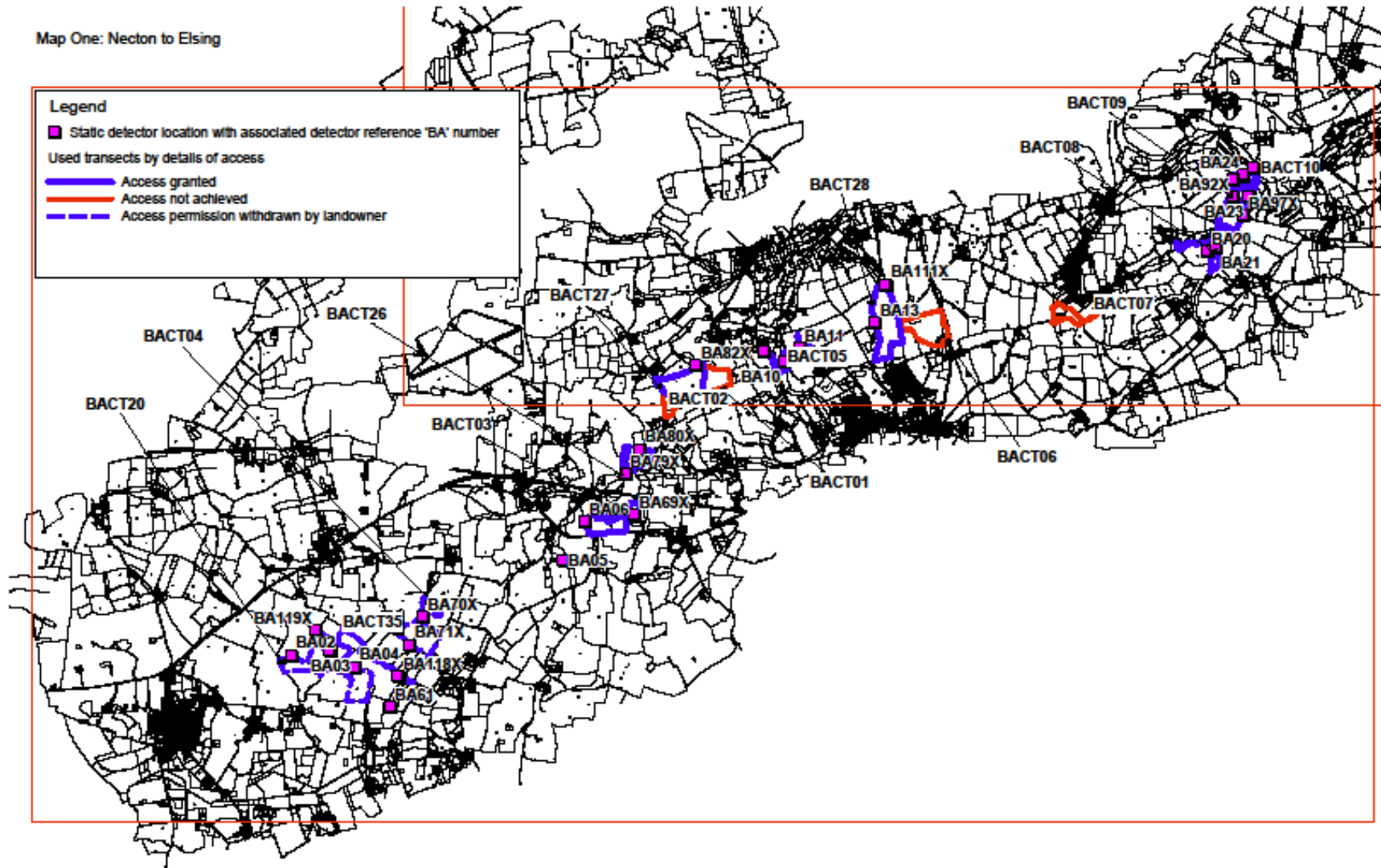
Appendix 5: Maps

Four overview maps are provided below showing the locations of the following transects.

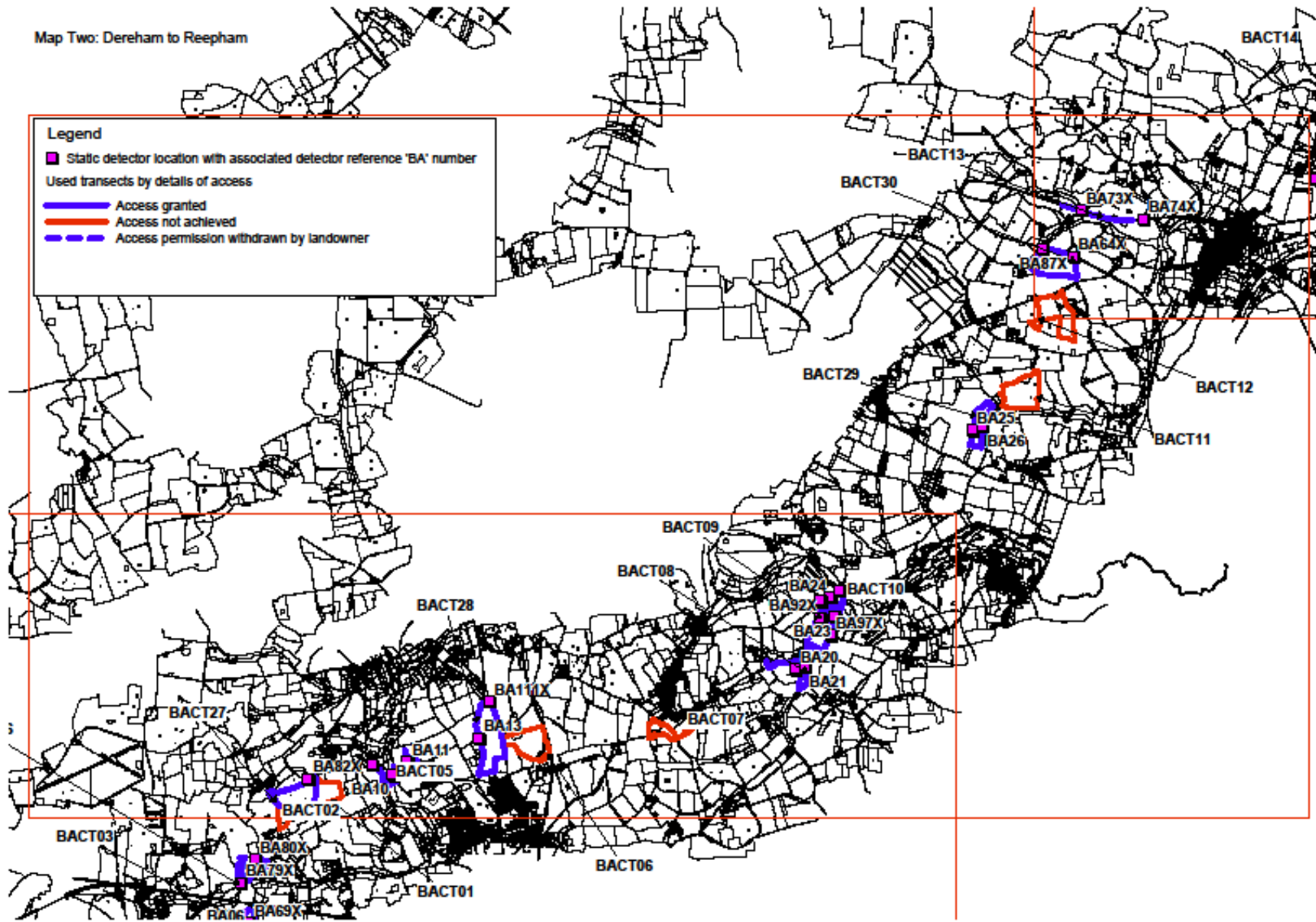
Transects #

BACT01	BACT19
BACT02	BACT20
BACT03	BACT21
BACT04	BACT22
BACT05	BACT23
BACT06	BACT24
BACT07	BACT25
BACT08	BACT26
BACT09	BACT27
BACT10	BACT28
BACT11	BACT29
BACT12	BACT30
BACT13	BACT31
BACT14	BACT32
BACT15	BACT33
BACT16	BACT34
BACT17	BACT35
BACT18	

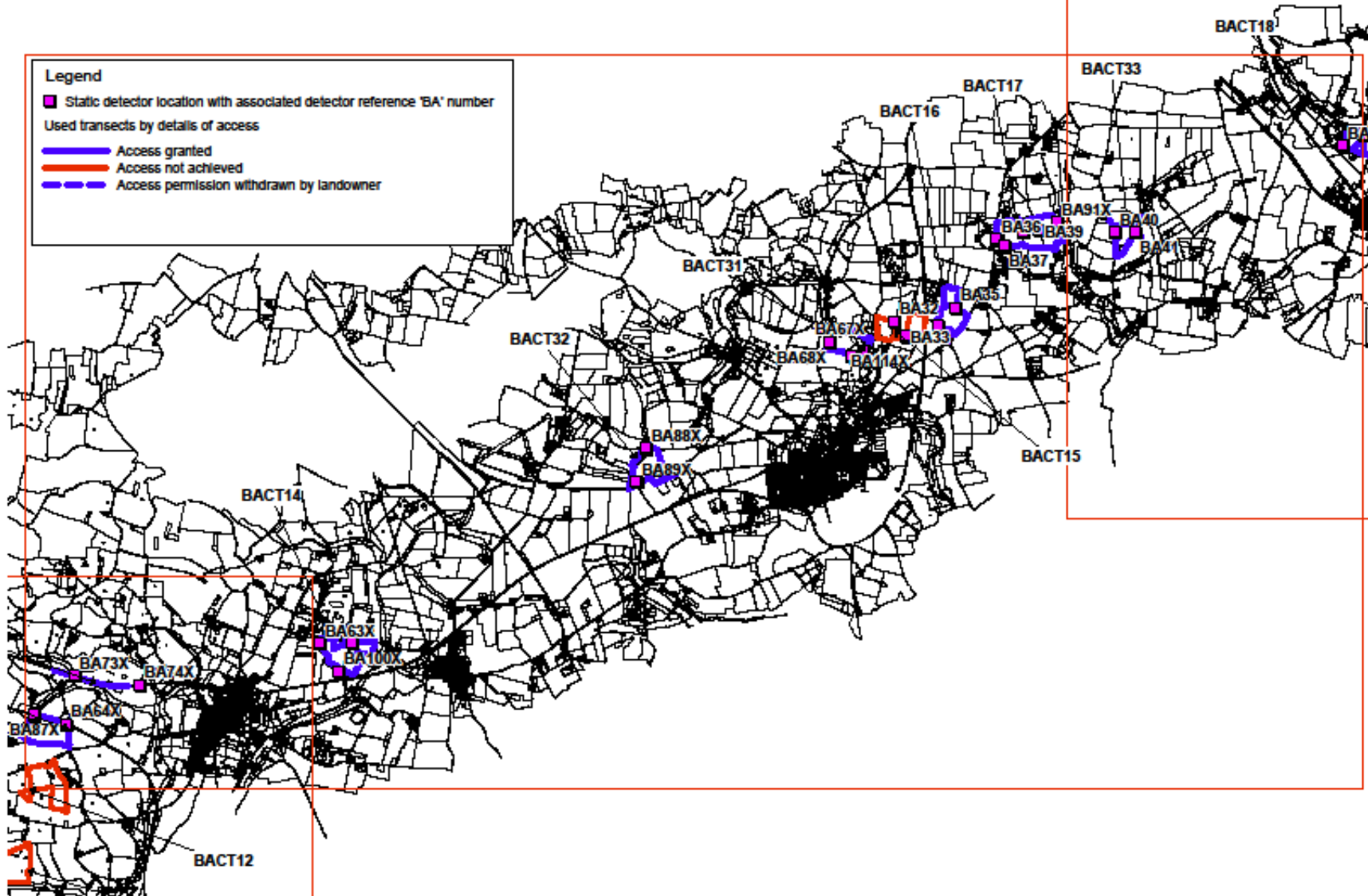
Map One: Necton to Elsing



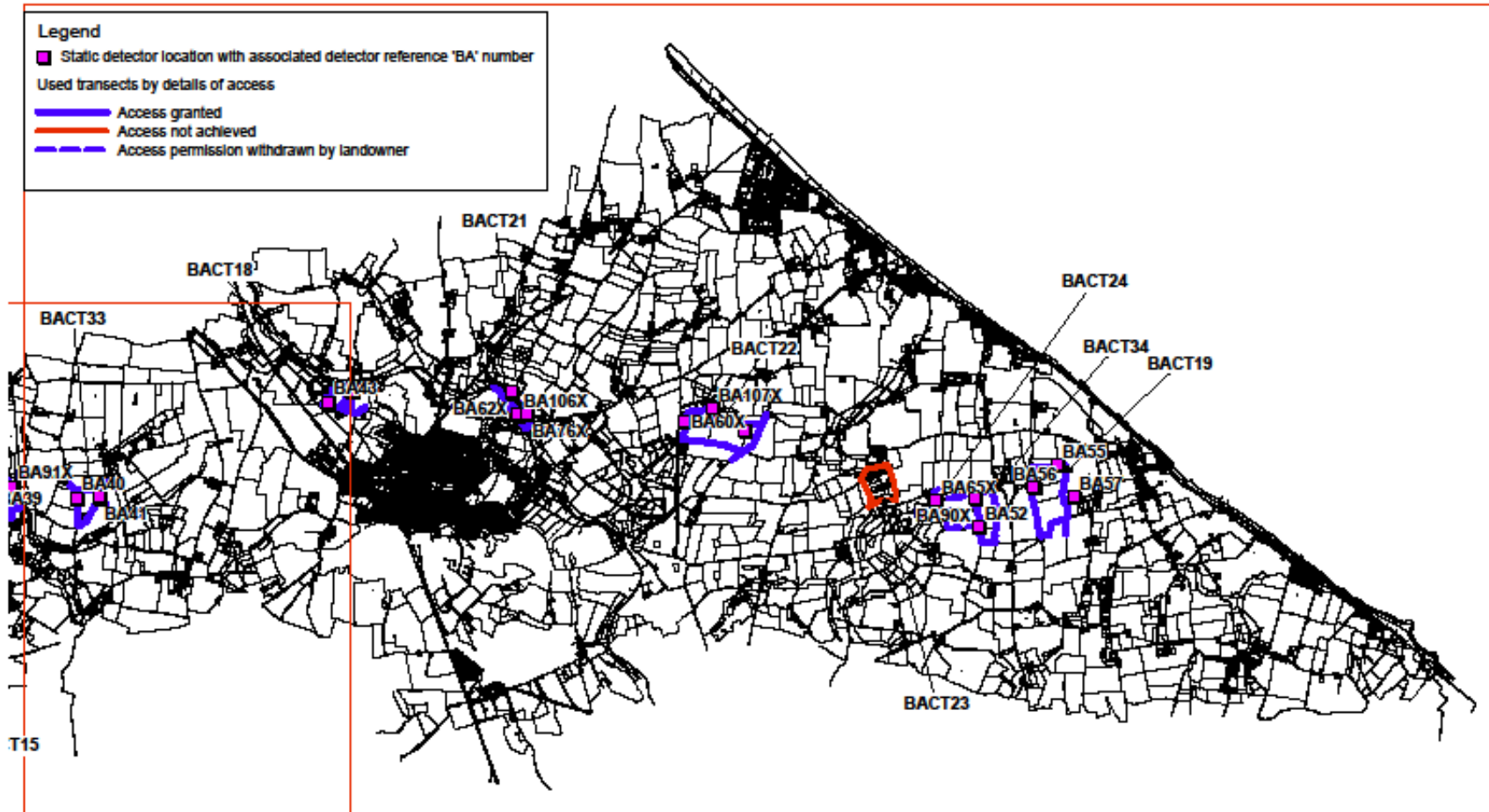
Map Two: Dereham to Reepham



Map Three: Reepham to Felmingham



Map Four: Felmingham to Walcott





Norfolk Boreas Bat activity surveys

Survey Scope :	Bat activity surveys
Prepared on behalf of :	Royal HaskoningDHV
Report reference :	2017/147.2
Date of survey/s :	April – October 2018

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Norfolk Wildlife Services is a member of the Association of Wildlife Trust Consultancies (AWTC) which is also a corporate member of the Institute of Environmental Management and Assessment (IEMA).

Report prepared by :	Checked by :	Approved by :	Status :
Sally McColl Date : 16.11.2018	Ben Christie 16.11.2018	Chris Smith 16.11.2018	V1 - DRAFT FOR CLIENT COMMENT
Ben Moore Date : 18.12.2018	Sally McColl 18.12.2018	Sally McColl 18.12.2018	V2 – SECOND DRAFT FOR CLIENT COMMENT
Ben Moore Date : 07.01.2019	Sally McColl 07.01.2019	Sally McColl 07.01.2019	V3 - FINAL

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1. Executive Summary

1.1. Baseline data to inform the Norfolk Boreas Environment Impact Assessment (EIA) was collected in 2017 as part of the Norfolk Vanguard Project. Following a review of this baseline data, 15 'priority areas' were identified as locations for further ecological surveys for the Norfolk Boreas Project.

1.2. An Extended Phase 1 Habitat Survey of these priority areas conducted in Spring 2018 identified seven habitat networks within the priority areas which were regarded as providing 'high' suitability for supporting commuting and foraging bats.

1.3. The purpose of the surveys was to ascertain, based on transect and static detector surveys, whether bats are commuting and foraging within the seven habitat networks recognised as being of 'high' suitability as identified within Norfolk Boreas Offshore Wind Farm Environmental Impact Assessment: Phase 2 Ecological Surveys Scope (Royal HaskoningDHV, 2017), and if so, which species and in what numbers.

1.4. The following guidance document was used to inform development of the survey methodology: Bat surveys for professional ecologists: good practice guidelines. Bat Conservation Trust. (Collins (Ed), 2016). A specific protocol is set out in this document and any divergences in practice from this protocol during delivery have been noted.

1.5. Following a review of the priority areas identified during the Extended Phase 1 Habitat Survey by Norfolk Wildlife Services, it was decided to omit surveying the priority area 'Wendling Carr CWS HDD receptor site' adjacent to Dillington as the habitats of interest were covered by BACT26 for Norfolk Vanguard Project (Norfolk Wildlife Services Ltd, 2018) and to split priority area 'HDD receptor site and flood plain habitats at River Bure' into two transects as the suitable habitat was grouped into two distinct areas separated by the old Cromer Road.

1.6. In total seven transects were identified around the priority areas, with three static detector deployment locations along each transect.

1.7. Between April and October 2018, 8 walked transects were carried out at each survey location (7 dusk surveys and 1 dawn survey) resulting in a total of 56 transect surveys and 1023 complete nights of static detection at 21 locations. Recordings were subject to analysis using Kaleidoscope acoustic analysis software, and the results subsequently quality assured.

1.8. There were no significant limitations to the surveys.

1.9. Bats were recorded on all transects. In total seven species of bat were recorded across the survey period and across the survey area. A further three species aggregations, where calls could not be identified down to species level of 'large bats', '*Myotis spp.*' and '*Pipistrelle spp.*' were recorded. Evidence of the following species and aggregations were found within the study area:

Barbastelle	<i>Barbastella barbastellus</i>
Serotine	<i>Eptesicus serotinus</i>
Myotis aggregate	<i>Myotis spp.</i>
Noctule	<i>Nyctalus noctula</i>
Large bat aggregate	<i>Large Bat Spp.</i>
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>

Common pipistrelle	<i>Pipistrellus pipistrellus</i>
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>
Pipistrelle aggregate	<i>Pipistrellus spp.</i>
Brown long-eared	<i>Plecotus auritus</i>

1.10. Barbastelle bats were widespread across the survey area and were present on each transect. However, records were generally sparse. Most frequently recorded on BACT03, BACT06 and BACT07 where a maximum of 16, 9 and 11 passes respectively. For further details, refer to each individual transect summary report.

1.11. Summary results, including number of bat passes along key transect features for each species are presented for each survey location within this report and full survey results are given in a short separate 'Transect Summary' report for each location. Static and transect recordings are available on request from Norfolk Wildlife Services Ltd.

1.12. From this point onwards the term 'survey location' will be used to reference each transect route and 'locality' will be used to describe the nearest settlement for each survey location.

2. Introduction

2.1. Project background

2.1.1. The Norfolk Boreas Offshore Wind Farm site is located 73km off the coast of Norfolk, at the closest point. The project would comprise of an array of offshore wind turbines and offshore substations which will be connected to the shore by offshore export cables.

2.1.2. The project will also require onshore infrastructure in order to transmit and connect the offshore wind farm to the National Grid, which in summary would comprise:

- Landfall;
- Onshore cable route (60km);
- An onshore project substation; and
- Works at the Necton National Grid substation (including extension of the existing substation, interface cables, and modification of the overhead power lines).

2.1.3. Norfolk Boreas is the sister project to the proposed Norfolk Vanguard offshore wind farm project which will be located across two offshore wind farm sites, adjacent to the Norfolk Boreas offshore wind farm site. Norfolk Vanguard is being developed first and its Environmental Impact Assessment (EIA) and project design development are at a more advanced stage than for Norfolk Boreas. As both projects would connect to the existing Necton National Grid substation, there has been a strategic approach to identifying locations for all onshore infrastructure with the aim of optimising overall design and reducing impacts where practical.

2.2. Survey Scope

2.2.1. Development of Survey Scope

2.2.1.1. As Norfolk Boreas is a Nationally Significant Infrastructure Project (NSIP) an EIA is required as part of a Development Consent Order (DCO) application under the Planning Act 2008.

2.2.1.2. An Extended Phase 1 Habitat Survey of the 15 priority areas was conducted in February 2018 (Royal HaskoningDHV, 2018). The Extended Phase 1 Habitat Survey identified habitat networks within seven of the priority areas which were assessed as providing high potential to support commuting and foraging bats. The Extended Phase 1 Habitat Survey therefore recommended undertaking bat activity surveys of these habitat networks in order to understand the potential impacts of the Norfolk Boreas project upon the species utilising these habitats.

2.2.1.3. Norfolk Wildlife Services were appointed in February 2018 to undertake additional ecological surveys on the data gaps identified at these priority areas plus a 50m buffer.

2.2.1.4. Norfolk Boreas Offshore Wind Farm Environmental Impact Assessment: Phase 2 Ecological Surveys Scope (Royal HaskoningDHV, 2017), produced in December 2017, set out the Survey Scope for delivering bat activity surveys within the seven priority areas. Norfolk Wildlife Services used the Survey Scope to deliver the bat activity transect surveys. The approach used by Norfolk Wildlife Services to deliver this scope (herein the 'Survey Protocol') is set out in Section 3.

2.2.2. Survey Scope

Transects

2.2.2.1. The seven priority areas identified during the Extended Phase 1 Habitat Survey (Royal HaskoningDHV, 2018) each contained hedgerows, woodland edges, scrub vegetation or watercourses which are connected with the wider environment and therefore could provide commuting or foraging habitats for bats. The habitats within each priority area

were identified in the Survey Scope as a single habitat network. Therefore, for the purposes of this Survey Scope it has therefore been assumed that seven habitat networks (one per priority area) in total will require bat activity surveys.

2.2.2.2. The seven priority areas were proposed within the Survey Scope to be surveyed as seven bat activity transects, each indexed by a number (BACT01, BACT02, etc.) encompassing as far as possible the groupings of identified habitats of interest.

2.2.2.3. The locations of the seven priority areas described above are shown in *Appendix 1* of this report.

Statics

2.2.2.4. Along each transect static bat detectors were proposed to be placed at three specified locations to collect additional bat activity data over five consecutive nights. Each static detector location indexed by a number (BA01, BA02, etc.) was chosen by surveyors to encompass identified habitats of interest as far as possible.

2.2.2.5. The Survey Scope was put together following the guidelines set out in the Bat Conservation Trust's Good Practice Guidelines (Collins, 2016).

2.3. Aim of report

2.3.1. The aim of this report is to present the findings of the bat activity surveys conducted within the seven priority areas.

2.4. Survey objective

2.4.1. To determine the nature, frequency, species-composition and seasonal variability of bats commuting and foraging activity along all linear features within the priority areas identified by the Extended Phase 1 Habitat Survey (Royal HaskoningDHV, 2018) as potentially providing 'moderate' or 'high' suitability for supporting commuting or foraging bats.

3. Methodology

3.1. Section 3.1 sets out the proposed Survey Protocol as agreed between Royal HaskoningDHV and Norfolk Wildlife Services prior to any field work commencing, and Section 3.2 sets out how the surveys were delivered in relation to the protocol and identifies any deviations or modifications that took place during the delivery phase.

3.1. Survey Protocol

Relevant guidance

3.1.1. The following guidance document was used to inform development of the survey methodology: Collins, J. (Ed.). (2016). Bat surveys for professional ecologists: good practice guidelines. Bat Conservation Trust.

Survey locations

3.1.2. The survey locations are presented in *Appendix 1* and descriptions of these locations are summarised in *Table 1* below.

Table 1: Transect description and habitat suitability assessments

Transect reference	Locality	OS grid references	Habitat Suitability Assessment ¹	Description of transect context
BACT01	Ridlington	TG346305	High	Improved grassland used by grazing sheep. Deciduous woodland edge and drainage ditches.
BACT02	Witton	TG307320	High	Arable field. Mature native species hedgerows and deciduous woodland edge along the eastern boundaries.
BACT03	Bure North: Aylsham	TG193285	High	Arable field, deciduous woodland edge towards the east, surrounded by native species hedgerow.
BACT04	Bure South: Aylsham	TG188279	High	Arable field and improved grassland used for grazing by cattle. Woodland edge and established hedgerows.
BACT05	Salle	TG128244	High	Arable field with established hedgerows around the boundary.
BACT06	Reepham	TG097240	High	Improved grassland used for grazing by cattle, central stream and thick gorse run through the middle (north to south). Surrounded by mature trees and established hedgerow.
BACT07	Sparham	TG068205	High	Arable field and semi-improved grassland. Woodland edge and stream.

Survey methodology

3.1.3. A full technical protocol for the collection of data using static bat detectors (SM4s) and subsequent bat call analysis is given in Annex 1: Process for auto identification is available on request.

Transects

3.1.4. Proposed transect routes will be designed in seven priority areas. Each one will encompass three static detector locations.

¹ Habitat suitability assessment is based upon guidelines set out in BCT good practice guidelines (Collins, 2016)

3.1.5. All habitat networks scoped into the assessment will be subject to a bat activity transect survey, which will cover the full extent of each habitat network as far as possible.

3.1.6. Transect surveys will involve walking at a constant speed along each linear bat habitat (or the one edge of the two-dimensional bat habitat) recording observations such as number of bats, flight direction, flight height, behaviour, appearance, relative speed and location of observations. Weather conditions including temperature, wind speed and precipitation, will be recorded at the start and end of each survey visit.

3.1.7. Field observation will be relied upon as the primary method for species identification. Bat detectors will be used to listen to bats during surveys. An SM4 ZC bat detector unit with an attached GPS will be used to make a permanent record of the transect.

3.1.8. A field recording set will be retained in the compressed Zero Crossing Analysis (ZCA) format. Laboratory sound-analysis will subsequently be used to identify the calls of all bat species recorded during the transect surveys.

Statics

3.1.9. For all transects surveyed, static detector surveys will be set up in parallel.

3.1.10. These will involve placement of a static detector at locations identified as suitable through judgement of the surveying ecologist whilst on site. SM4 ZC recorders will be deployed in suitable locations separated from stock and other potential hazards. Where an SM4 ZC fails during deployment, the survey will be repeated.

3.1.11. Data from these surveys will be recorded and subject to sound-analysis to identify species and pass numbers following the survey.

Survey timing and weather conditions

Transects

3.1.12. For transects of “high” suitability for commuting or foraging bats (i.e. all transects scoped into the bat activity surveys), these will be subject to one survey visit per month from April to October including one dusk and pre-dawn survey within a 24-hour period (8 visits).

3.1.13. The transect surveys will commence at sunset, and cease a minimum of 2 hours after sunset. Sunset and sunrise times will be standardised using the time and date website: <https://www.timeanddate.com/sun/uk/norwich>.

3.1.14. Surveys will not be carried out when the temperature is below 10°C at sunset/sunrise, or during heavy rain or strong wind unless justified by the surveying ecologist.

Statics

3.1.15. The surveys will use SM4 ZC static detectors. Deployment of SM4 ZC recorders will follow the user guide².

3.1.16. For transects identified as being of high suitability for commuting or foraging bats, static bat detector surveys will take place at three locations on five consecutive nights per month between April and October.

3.1.17. Static detector surveys will be programmed to commence 30 minutes before sunset, and cease 30 minutes after sunrise.

3.1.18. Periods of prolonged bad weather will be noted for static detectors.

Equipment

² <https://www.wildlifeacoustics.com/images/documentation/SM4-BAT-ZC-USER-GUIDE.pdf>

3.1.19. Whilst walking the transect, surveyors will use SM4 ZCA units with an attached GPS as well as their personal bat detectors to listen to any echolocation calls. The make of bat detector used by each surveyor will be recorded.

3.1.20. Wildlife Acoustics Kaleidoscope software will be used for analysis.

Personnel

3.1.21. All surveys will be undertaken by suitably experienced bat surveyors, who will either be members of the Chartered Institute of Ecology and Environmental Management (CIEEM) or act according to its code of conduct.

3.1.22. No lone working is permitted, each transect will be undertaken by a single surveyor. An additional safety worker will be present, but will only assist the surveyor (e.g. by note taking).

3.2. Survey delivery

3.2.1. The protocol was followed for the activity surveys as far as possible or reasonable. Variations from this are noted in 4.2.2. Limitations.

3.2.1. Survey methodology as delivered

Access to survey locations

3.2.1.1. It was decided to omit surveying the priority area 'Wendling Carr CWS HDD receptor site' adjacent to Dillington as the habitats of interest were covered by BACT26 for Norfolk Vanguard Project (Norfolk Wildlife Services Ltd, 2018).

3.2.1.2. It was decided to split priority area 'HDD receptor site and flood plain habitats at River Bure' into two transects as the suitable habitat was grouped into two distinct areas separated by the old Cromer Road.

3.2.1.3. Access was possible to all seven of the final agreed survey locations (BACT01-BACT07).

3.2.1.4. Details of each transect and static detector location are given in Appendices 2-3.

3.2.1.5. An alternative transect route was walked on one occasion at BACT01, due to lack of access in April 2018 and a diversion of the transect route was taken at BACT03 and BACT04 due to the presence of livestock within a section of the transect.

3.2.1.6. Details of any deviations to the transects made due to changes in access permission are outlined in *Table 2* below.

Table 2 Summary of access arrangements made for transects.

Transect reference	Details of access	Changes to transect
BACT01	Access not granted until May 2018	Alternative route walked to the west of the transect in April 2018. Then identified transect route walked from May - October 2018
BACT02	Access granted	None
BACT03	Livestock grazing within the grassland to the east of the transect June to September	Diverted route undertaken June to September
BACT04	Livestock grazing within the grassland to the south of the transect in May, July and October	Diverted route undertaken in May, July and October
BACT05	Access granted	None
BACT06	Bull in field in July	Attempted to carry out dawn and dusk back to back survey in July. However, due to livestock these surveys were aborted but were carried out once the cattle had been removed
BACT07	Access granted	None

Equipment used

3.2.1.7. Equipment used for the surveys is detailed below:

- Head torch with extra fully charged batteries
- Bat detectors (any type) and recording equipment with GPS and microphone
- SM4 ZC static detectors with microphone and GPS x 3
- Bungee ties
- Thermometer
- Mobile phone
- Weather writer and pen
- Bat activity transect survey recording form and map
- Toolbox talk form

Survey effort

Transects

3.2.1.8. A summary of survey effort by month is given in *Table 3* below. Where two dates are given in any one month this highlights the dusk and dawn back to back survey. Where these dates are both the same, this indicates that the dawn survey was carried out before the dusk survey.

Table 3 Bat activity transect survey effort by month.

Transect reference	April	May	June	July	August	September	October	Total number of surveys
BACT01	26.04.2018	21.05.2018	13.06.2018	11.07.2018	08.08.2018	12.09.2018 12.09.2018	10.10.2018	8
BACT02	20.04.2018	10.05.2018	14.06.2018	11.07.2018	10.08.2018	13.09.2018 14.09.2018	11.10.2018	8
BACT03	13.04.2018	15.05.2018	18.06.2018	19.07.2018	21.08.2018	25.09.2018 26.09.2018	15.10.2018	8
BACT04	13.04.2018	22.05.2018	18.06.2018	18.07.2018	23.08.2018	17.09.2018 18.09.2018	15.10.2018	8
BACT05	19.04.2018	09.05.2018	27.06.2018	19.07.2018	16.08.2018	26.09.2018 27.09.2018	18.10.2018	8
BACT06	16.04.2018	01.05.2018	05.06.2018	03.07.2018	16.08.2018	04.09.2018	02.10.2018 03.10.2018	8
BACT07	19.04.2018	03.05.2018	21.06.2018	05.07.2018	02.08.2018	06.09.2018 06.09.2018	03.10.2018	8

Static detector

3.2.1.9. Full dates for static detector deployments are given in *Appendix 4*.

3.2.1.10. A summary of static detector effort by month is given in *Table 4* below.

Table 4 Static detector deployment effort by month.

Static detector reference	Associated transect reference	April	May	June	July	August	September	October	Total number of compliant surveys
BA01	BACT01	8	8	6	6	6	6	7	7
BA02	BACT01	8	8	6	6	6	6	7	7
BA03	BACT01	8	8	6	6	6	6	7	7
BA04	BACT02	6	6	6	6	6	6	6	7
BA05	BACT02	6	6	6	6	6	6	6	7
BA06	BACT02	6	6	6	6	6	6	6	7

Static detector reference	Associated transect reference	April	May	June	July	August	September	October	Total number of compliant surveys
BA07	BACT03	6	6	7	6	6	7	7	7
BA08	BACT03	6	6	7	6	6	7	7	7
BA09	BACT03	6	6	7	6	6	7	7	7
BA10	BACT04	6	7	7	7	8	7	7	7
BA11	BACT04	6	7	7	7	8	7	7	7
BA12	BACT04	6	7	7	7	8	7	7	7
BA13	BACT05	7	6	6	11	7	6	6	7
BA14	BACT05	7	6	6	11	7	6	6	7
BA15	BACT05	7	6	6	11	7	6	6	7
BA16	BACT06	7	5	6	7	6	14	7	7
BA17	BACT06	7	5	6	0	6	14	7	6
BA18	BACT06	7	5	6	7	6	14	7	7
BA19	BACT07	7	7	8	5	6	13	14	7
BA20	BACT07	7	7	8	5	6	13	14	7
BA21	BACT07	7	7	8	5	6	13	14	7

Timing and weather conditions

3.2.1.11. The weather conditions and timings during the surveys are given in *Table 11* in *Appendix 3*. An assessment of any related limitations for each survey can be found in 3.2.2. Limitations.

3.2.1.12. In general, the weather throughout the 2018 survey season was exceptionally hot and dry with light wind conditions and periods of drought. These conditions were consistent with the suitable survey conditions, as set out in the Survey Protocol (Section 3.2). Only occasional surveys were postponed due to bad weather.

3.2.1.13. During two dawn surveys in September and October, the temperature at dawn fell to just below the 10°C specified in the Survey Protocol, although the surveys were compliant at the beginning of the survey.

Personnel

3.2.1.14. All surveys were undertaken by experienced bat surveyors, who are listed below in the table below. Other named staff on surveys were safety workers: Nicky Talbot, Joseph Hassall, Piranesi O'Hare Evans, Stephanie Ford, Jamie Murphy, Aidan Holden, Carolyn Smith, Rebecca Banks, Lisa Treadwell and Martin Parker.

3.2.1.15. Bat surveys were recorded using an SM4 ZC bat detector, but surveyors also had personal equipment as shown below.

Table 5 Surveyor experience

Team member	Experience	Memberships	Equipment used
James Allitt	15 years' experience of ecological surveying, including bats	-	Batbox Duet
Ben Christie	6 years' experience in ecological surveying, including bats. Holds a level 1 bat licence (Licence reference: 2017-30047-CLS-CLS)	ACIEEM	Batbox Duet/Echometer Touch
Ben Moore	3 years' experience of ecological surveying, including bats	GradCIEEM	Batbox Duet
Sally McColl	11 years' experience of ecological surveying, including bats	MCIEEM	Batbox Duet

3.2.2. Limitations

3.2.2.1. A summary of the survey limitations encountered for all transects is set out below. Detailed limitations for each survey transect, including any notable limitations which may affect data quality, are set out in *Table 7*.

Survey timing

3.2.2.2. Eight surveys were carried out at each transect. However, a full transect was not undertaken at BACT06 in July as the survey was aborted as a result of aggressive cattle behaviour and BA17 was not deployed on this occasion. There was sufficient data collected from other static deployments and walked surveys at this survey location to deem this as an insignificant limitation.

3.2.2.3. Three surveys were just under the specified two-hour survey length in April 2018, by a maximum of five minutes. This was not seen as a significant limitation.

3.2.2.4. BA15 had no recordings in July as the microphone was destroyed by farm machinery and BA13 had no recordings in August due to a SIM card error. In addition, static detectors on an additional 12 occasions, recorded on fewer than the deployed number of days. It is unclear whether this was an equipment malfunction, although no equipment appeared faulty on inspection, or whether there were genuinely no bats recorded on the additional dates that the detectors were deployed. Sufficient data was still collected by these deployments which hadn't any recordings on certain nights to consider this as an insignificant limitation.

3.2.2.5. The duration of transect surveys is given in *Appendix 3*. Static detector deployment details are given in *Appendix 4*.

Weather conditions

3.2.2.6. In general, the weather throughout the survey programme was warm and dry which correlated with the heatwave observed across the country throughout the summer which led into a prolonged mild autumn.

3.2.2.7. Weather was calm, dry and mild during October 2018, and early autumn coverage for bats was therefore good where access was available to carry out the surveys. Weather conditions encountered during each survey are provided within *Table 11*.

3.2.2.8. On two occasions the temperature was 8°C at dawn for BACT03 and BACT06 (during September and October respectively). All other surveys were compliant with Survey Protocol. This was not seen as a significant limitation as this temperature was recorded at the end of these two surveys after the bats had been recorded during the transect surveys.

Survey approach

3.2.2.9. Transects were limited in length by landownership boundaries in relation to habitats of interest. All surveys were designed to be of a length to ensure that two circuits of the same route which lasted two hours for consistency between transects.

3.2.2.10. No behavioural observations were available for static detector surveys, when deployed following transect surveys, but this was not seen as significant limitation. In practice since all transect surveys continued until complete darkness, surveyors' observations would have been limited to contacts on bat detectors with bats without further details (e.g. on their exact locations or direction of flight, etc). In total there were 1023 complete nights of static detection compared to 56 transects.

3.2.2.11. Statics were deployed by attachment to suitable objects such as trees and could not be placed in the open due to farming operations. The microphones on the statics are affected by surrounding clutter for example trees and buildings, but also the availability of suitable deployment sites which means that they cannot be placed in open wetland areas. This is not seen as a major limitation, but may alter relative numbers of tracks.

Data analysis

3.2.2.12. Detectability of bats varies by species and the intensity and loudness of their calls, this is particularly the case with brown long-eared bats *Plecotus auritus*. A classification for this is given within Barataud (2015). In general, this is not seen as presenting a significant limitation to the survey results but means that numerical results between species are not comparable.

3.2.2.13. It is likely that brown long-eared bats, which are exceptionally quiet in echolocating, will be underrepresented within the results. Russ (2012) states that brown long-eared bats whisper their calls and to stand a chance of getting a quality recording they need to be calling within close proximity of the bat detector (within 5m). However, there is no evidence to indicate the scale of the effect this has on this species. Therefore, brown long-eared bats may be present at sites where survey results indicate absence. This is a known issue when undertaking bat activity surveys and provided that this caveat is placed on the data, no other constraints are envisaged.

3.2.2.14. Some species identifications were aggregated during analysis due to detectability issues. These included all bats in the *Myotis* genus of which any species from within this group was analysed as *Myotis* species aggregate ('MYOSPP'). Likewise, due to the nature of difficulties in distinguishing some calls between *Nyctalus noctula*, *Nyctalus leisleri* and *Eptesicus serotinus* where call parameters were sometimes vague, these were classified as Large Bat aggregate ('LGEBAT'). Similarly, where calls belonging to individuals of the *Pipistrellus* genus which couldn't clearly be separated to one species or another, these were analysed as *Pipistrellus* species aggregate ('PIPSPP') (see *Table 8*).

Limitations by transect

3.2.2.15. *Table 6* compares the number of survey visits achieved for each transect throughout the year against the recommended number of visits set out in the Survey Protocol.

3.2.2.16. *Table 7* summarises the limitations for each transect: access limitations, including any visibility issues, weather and survey effort limitations for transects and static detector deployments. It makes a categorical assessment as to whether these limitations significantly affect the quality of the data.

Table 6 : Details of specified transect visit effort versus actual survey effort

Transect reference	Habitat Suitability Assessment	SPRING		SUMMER			AUTUMN		Total number of surveys undertaken	Proposed survey effort	Variation from proposed survey effort
		April 2018	May 2018	June 2018	July 2018	August 2018	September 2018	October 2018			
BACT01	High	1	1	1	1	1	1	1	8	8	None
BACT02	High	1	1	1	1	1	1	1	8	8	None
BACT03	High	1	1	1	1	1	1	1	8	8	None
BACT04	High	1	1	1	1	1	1	1	8	8	None
BACT05	High	1	1	1	1	1	1	1	8	8	None
BACT06	High	1	1	1	1	1	1	1	8	8	None
BACT07	High	1	1	1	1	1	1	1	8	8	None

Table 7 : Survey limitations – combined static and transect surveys

Transect reference	Habitat Suitability Assessment	Access limitations, including any visibility issues	Weather limitations	Static detector limitations	Transect survey limitations	Limitation to survey results
BACT01	High	Land owner permission not granted until May 2018 – an alternative transect route was carried out in April 2018.	None	September – BA01 - recordings for 2 days only October – BA01 - recordings for 3 days only	26.04.2018 – Survey time of 01:55	No significant impact. Sufficient survey data to indicate bat activity.
BACT02	High	None	None	N/A	20.04.2018 – Survey time of 01:59	No significant impact. Sufficient survey data to indicate bat activity.
BACT03	High	Livestock grazing within the grassland to the east of the transect June to September – diverted route undertaken.	26.09.2018 – 8°C at dawn	October – BA09 – recordings for 3 days only	N/A	No significant impact. Sufficient survey data to indicate bat activity.
BACT04	High	Livestock grazing within the grassland to the south of the transect May, July and October – diverted route undertaken.	None	July – BA10 – recordings for 3 days only July – BA12 – recordings for 1 day only August – BA10 & BA11 – recordings for 1 day only	23.08.2018 – Transect recorded on Echometer Touch due to SM4 malfunction	No significant impact. Sufficient survey data to indicate bat activity.
BACT05	High	None	None	June – BA14 – recordings for 4 days only July - BA15 – Microphone destroyed by farm machinery – no recordings August - BA13 – No data returned September – BA13 – recordings for 2 days only	N/A	No significant impact. Sufficient survey data to indicate bat activity.
BACT06	High	None	03.10.2018 – 8°C at dawn	July - BA17 – Not deployed due to aggressive livestock September – BA18 – recordings for 3 days only	03.07.2018 – Survey time of 00:22, aborted due to aggressive livestock	No significant impact. Sufficient survey data to indicate bat activity.
BACT07	High	None	None	August – BA19 – recordings on 3 days only October – BA20 – recordings on 1 day only	19.04.2018 – Survey time of 01:56	No significant impact. Sufficient survey data to indicate bat activity.

4. Results

4.1. Summary results for each transect are given in *Table 9: Summary results for each transect* below.

4.2. Full results are provided in the standalone 'Transect Summary' documents provided alongside this report.

4.3. In total seven species of bat were recorded across the survey period and across the survey area. A further three species aggregations, where calls could not be identified down to species level of 'large bats', '*Myotis spp.*' and '*Pipistrelle spp.*' were recorded. (See *Table 8*).

4.4. Barbastelles were widespread across the survey area and were present on each transect. However, records were generally sparse. Barbastelles were most frequently recorded on BACT03, BACT06 and BACT07 where a maximum of 16, 9 and 11 passes respectively.

4.5. Summary results, including number of bat passes along key transect features for each species are presented for each survey location within this report however, full survey results are given in a short separate 'Transect Summary' report for each survey location. Static and transect recordings are available on request from Norfolk Wildlife Services Ltd.

Table 8: Explanation of species, status and categories in results

Species	Scientific	Code	Notes ³	UK status ⁴
Barbastelle	<i>Barbastella barbastellus</i>	BARBAR	Sec 41; Annex II; IUCN NT	Rare
Serotine	<i>Eptesicus serotinus</i>	EPTSER	IUCN LT	Uncommon, largely restricted to south
Large bat aggregate	Not applicable	LGEBAT	Aggregated; Bat calls with FME<30kHz, but not identifiable further (covers serotine, noctule and Leisler's bats)	Not applicable
Myotis aggregate	<i>Myotis spp.</i>	MYOSPP	Aggregated; sometimes identifiable in field	Various
Leisler's bat	<i>Nyctalus leisleri</i>	NYCLEI	IUCN LT; confirmed potential calls from statics	Uncommon in GB although may be under recorded, common in Ireland
Noctule	<i>Nyctalus noctula</i>	NYCNOC	Sec 41; IUCN LT	Uncommon
Brown long-eared	<i>Plecotus auritus</i>	PLEAUR	Sec 41; IUCN LT; low detectability	Common
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	PIP NAT	IUCN LT	Uncommon but widespread, may be under recorded
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	PIPPIP	IUCN LT	Common
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	PIPPYG	Sec 41; IUCN LT	Common
Pipistrelle species aggregate	<i>Pipistrelle spp.</i>	PIPSPP	Aggregated; individuals belonging to the <i>Pipistrellus</i> genus calling at intermediate frequencies	Various
Noise	Not applicable	NOISE	Noise includes non-bat, environmental, biological and ambient sounds	Not applicable
NoID	Not applicable	NoID	Definite bat calls with <3 pulses and therefore not providing enough information to confirm a species ID	Not applicable

Abbreviations

*IUCN categories: LC is Least Concern, NT is Near Threatened, DD is Data deficient; see www.iucnredlist.org for more details.

Sec 41: Section 41 species of principal importance; often referred to as BAP species.

Annex II: Annex II of European Habitats Directive; all bats are protected under Annex IV.

³ Source: Bat Conservation Trust (2016) Table of legal and conservation status of UK bat species. https://cdn.bats.org.uk/pdf/Table_of_legal_and_conserv_status_of_UK_bats.pdf?mtime=20181101151557

⁴ Source: Bat Conservation Trust (2017) The state of the UK's bats 2017 National Bat Monitoring Programme Population Trends https://cdn.bats.org.uk/pdf/State_of_UKs_Bats_2017-2.pdf?mtime=20181101151557

Table 9 : Summary of results for each transect

Transect reference	Habitat suitability assessment	Species present	Key habitats and features for bats	Additional notes on bat activity
BACT01	High	BARBAR, EPTSER, LGEBAT, MYOSPP, NYCNOC, PLEAUR, PIPNAT, PIPPIP, PIPPYG, PIPSPP	<p>The block of woodland along the northern boundary and the stream along the western boundary were both key commuting and foraging features for bats.</p> <p>The eastern road and hedgerow was also important for commuting and foraging bats.</p> <p>The remainder of the transect was very quiet for bats, perhaps due to the open nature of the transect.</p>	Barbastelles recorded towards the western aspect of the transect
BACT02	High	BARBAR, EPTSER, LGEBAT, MYOSPP, NYCNOC, PLEAUR, PIPNAT, PIPPIP, PIPPYG, PIPSPP	<p>The eastern boundaries of the transect route saw the highest levels of common pipistrelle foraging activity, along the woodland edges and hedgerows.</p> <p>Common and soprano pipistrelles were noted to forage along the tree-lined, unnamed minor road which borders the northern boundary of the transect route.</p>	Isolated barbastelle passes towards the south of the transect on BA06.
BACT03	High	BARBAR, EPTSER, LGEBAT, MYOSPP, NYCNOC, PLEAUR, PIPNAT, PIPPIP, PIPPYG, PIPSPP	<p>Common and soprano pipistrelles were often observed foraging along the northern hedgerow.</p> <p>The woodland edge along the eastern section of the transect was a popular foraging route for pipistrelles and noctules.</p>	Several barbastelle records throughout the year. Predominantly recorded by BA07 towards the east of the transect.
BACT04	High	BARBAR, EPTSER, LGEBAT, MYOSPP, NYCNOC, PLEAUR, PIPNAT, PIPPIP, PIPPYG, PIPSPP	<p>Woodland edges were noted as key foraging areas for both common and soprano pipistrelles.</p> <p>The hedgerow along the southern boundary of the grazing meadow was a key foraging route for pipistrelle bats.</p> <p>Common and soprano pipistrelles were commonly observed and recorded foraging under mature oak standards along the western boundary of the transect.</p>	Barbastelles were occasionally recorded along the southern and western boundaries of the transects at BA10 and BA11 respectively.
BACT05	High	BARBAR, EPTSER, LGEBAT, MYOSPP, NYCNOC, PLEAUR, PIPNAT, PIPPIP, PIPPYG, PIPSPP	<p>Boundary hedgerows with trees were the key features used by bats for foraging and commuting, particularly the western boundary as this is functionally linked with surrounding habitat including the Reephams Stream, woodland and disused railway to the south.</p>	Few records of barbastelle recorded across the transect on each static detector.

Transect reference	Habitat suitability assessment	Species present	Key habitats and features for bats	Additional notes on bat activity
BACT06	High	BARBAR, EPTSER, LGEBAT, MYOSPP, NYCNOC, PLEAUR, PIPNAT, PIPPIP, PIPPYG, PIPSPP	<p>Common and soprano pipistrelles were commonly recorded foraging along the western and northern boundaries.</p> <p>The canopy of trees surrounding stop points 06 and 12 were popular foraging habitat for common and soprano pipistrelles, where the Marriott's Way footpath runs east to west just outside of the transect.</p> <p>Pipistrelles were frequently recorded foraging along the woodland edge on the eastern boundary at stop points 04 and 10.</p>	Records of barbastelle during the spring and autumn towards the northern end of the transect at BA16.
BACT07	High	BARBAR, EPTSER, LGEBAT, MYOSPP, NYCNOC, PLEAUR, PIPNAT, PIPPIP, PIPPYG, PIPSPP	<p>The northern boundary was used by common and soprano pipistrelles as a commuting route.</p> <p>The eastern boundary and south-east corner had mainly common pipistrelle foraging on the edge habitat.</p> <p>The western boundary along the woodland edge had occasional pipistrelle foraging and commuting.</p>	Infrequent barbastelle passes across the whole transect.

5. Conclusion

5.1. A total of seven bat activity transects were carried out within six priority areas identified by Extended Phase 1 Habitat Survey (Royal HaskoningDHV, 2018) as providing “high” habitat suitability for supporting commuting or foraging bats between April and October 2018.

5.2. Between April and October 2018, 8 walked transects were carried out at each survey location (7 dusk surveys and 1 dawn survey) resulting in a total of 56 transect surveys and 1023 complete nights of static detection at 21 locations.

5.3. In total seven species of bat were recorded across the survey period and across the survey area. A further three species aggregations, where calls could not be identified down to species level of ‘large bats’, ‘*Myotis spp.*’ and ‘*Pipistrelle spp.*’ were recorded.

5.4. Barbastelle bats were widespread across the survey area and were present on each transect. However, numbers of bats recorded were generally low.



6. References

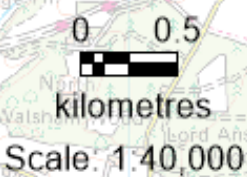
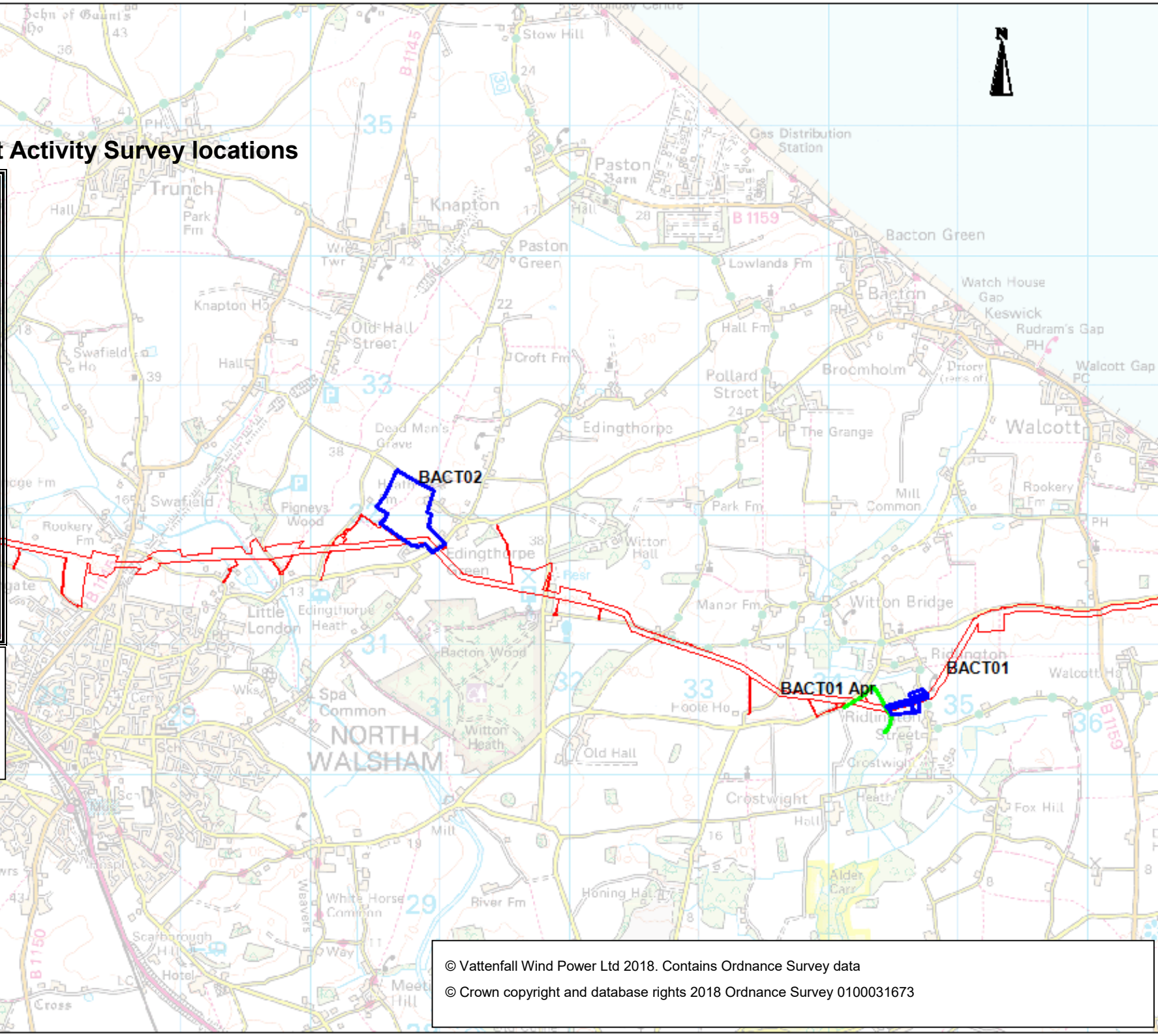
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Appendix 1: Bat Activity Survey locations


Project:		Report:	
Norfolk Boreas		Norfolk Boreas Bat Activity Transect Survey	
Title:			
Appendix 1: Bat Activity Survey Locations – Happingburgh to North Walsham			
Figure:		Drawing No:	
BACT-1		BACT-1-01-15112018	
Revision:	Date:	Size:	Scale:
01	15/11/2018	A4	1:40,000
Co-ordinate System: British National Grid			
Norfolk Wildlife Services			
22 Bewick House			
Thorpe Road			
Norwich			
NR1 1RY			

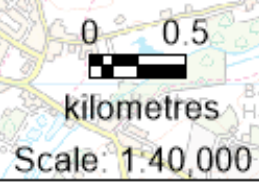
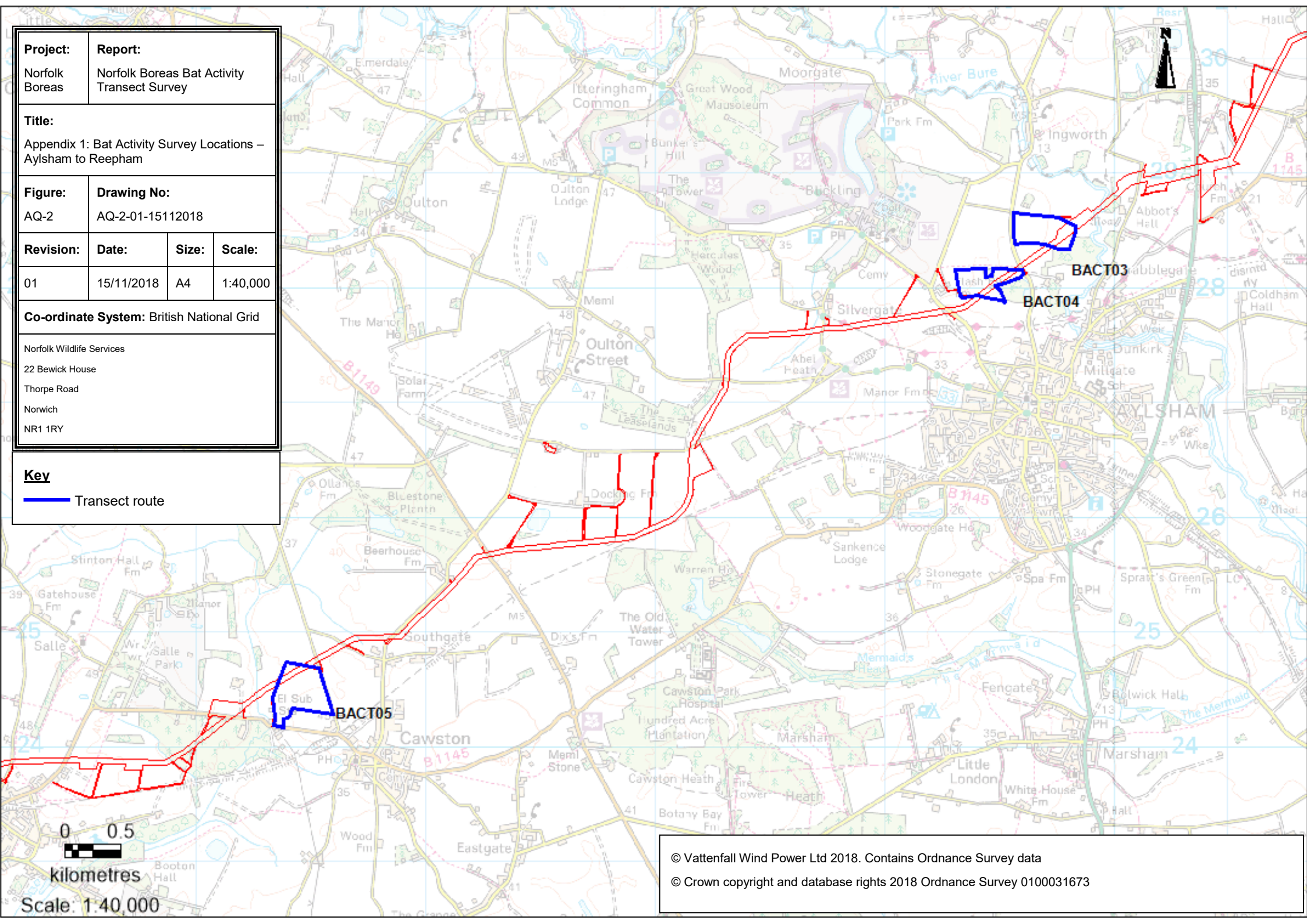
Key	
	Transect route
	Temporary transect route



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Project: Norfolk Boreas	Report: Norfolk Boreas Bat Activity Transect Survey		
Title: Appendix 1: Bat Activity Survey Locations – Aylsham to Reepham			
Figure: AQ-2	Drawing No: AQ-2-01-15112018		
Revision:	Date:	Size:	Scale:
01	15/11/2018	A4	1:40,000
Co-ordinate System: British National Grid			
Norfolk Wildlife Services 22 Bewick House Thorpe Road Norwich NR1 1RY			

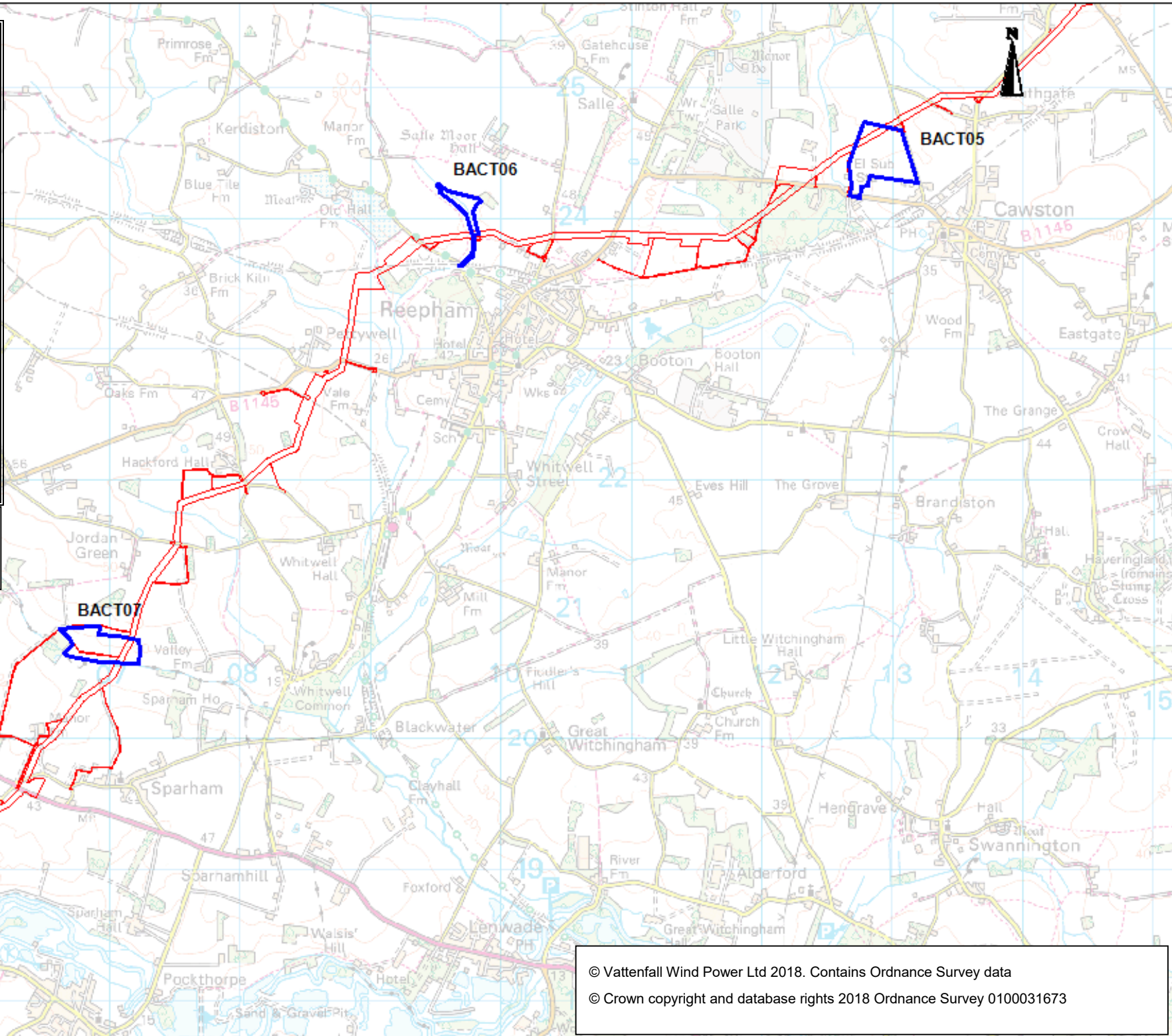
Key
 Transect route



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Project: Norfolk Boreas	Report: Norfolk Boreas Bat Activity Transect Survey		
Title: Appendix 1: Bat Activity Survey Locations – Sparham to Dereham			
Figure: AQ-3	Drawing No: AQ-3-01-18102018		
Revision:	Date:	Size:	Scale:
01	15/11/2018	A4	1:40,000
Co-ordinate System: British National Grid			
Norfolk Wildlife Services 22 Bewick House Thorpe Road Norwich NR1 1RY			

Key
 Transect route



0 0.5
kilometres
Scale 1:40,000

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Appendix 2: Static locations descriptions

Table 10: Static detector locations.

Transect reference	Static point	Grid reference	Static position
BACT01	BA01	TG3461830618	Semi mature oak situated alongside broadleaved woodland and improved grassland
BACT01	BA02	TG3445630499	Semi mature silver birch tree situated alongside stream
BACT01	BA03	TG3476830589	Semi mature oak situated adjacent to a minor road 'The Street'
BACT02	BA04	TG3069932324	Situated on a semi mature oak standard alongside arable field margin
BACT02	BA05	TG3090431939	Situated on an established field maple hedgerow
BACT02	BA06	TG3091431738	Situated on a semi mature oak standard alongside arable field margin
BACT03	BA07	TG1965128528	Situated on a mature oak standard alongside arable field margin
BACT03	BA08	TG1959328331	Situated on a semi mature cherry tree along deciduous woodland edge and arable field
BACT03	BA09	TG1924428387	Situated on a mature oak standard alongside arable field margin
BACT04	BA10	TG1914228082	Situated on a mature sycamore along deciduous woodland edge and arable field
BACT04	BA11	TG1864928162	Mature oak within native species hedgerow along boundary between two arable fields
BACT04	BA12	TG1890428091	Situated on a mature sycamore along deciduous woodland edge and arable field
BACT05	BA13	TG1267924484	Situated on mature hawthorn within established native species hedgerow
BACT05	BA14	TG1304424682	Mature oak within native species hedgerow along boundary between two arable fields
BACT05	BA15	TG1288524318	Mature oak within native species hedgerow along boundary between two arable fields
BACT06	BA16	TG0952724266	Situated on a fence post alongside established native species hedgerow
BACT06	BA17	TG0978724060	Situated on mature hazel within established native species hedgerow
BACT06	BA18	TG0980623881	Mature hawthorn adjacent to stream
BACT07	BA19	TG0664520672	Semi mature alder on woodland edge
BACT07	BA20	TG0691220605	Semi mature alder in a small copse surrounded by semi improved grassland
BACT07	BA21	TG0721620631	Semi mature oak with established native species hedgerow

Appendix 3: Transect survey effort

Table 11: Surveyor and weather details for each bat activity survey.

Transect reference	Surveyor	Date	Sunrise/Sunset	Start	End	Start Temp	End Temp	Wind (BWS)	Cloud cover	Precipitation
BACT01	BM ⁵ , SF ⁶	26.04.2018	20:10	20:05	22:00	12°C	11°C	1	2/8	None
BACT01	SM, SF	21.05.2018	20:53	21:13	23:14	11°C	9°C	1	2/8	None
BACT01	SM, POE ⁷	13.06.2018	21:18	21:24	23:24	18°C	14°C	2	8/8	None
BACT01	SM ⁸ , SF	11.07.2018	21:15	21:21	23:21	15°C	15°C	1	8/8	None
BACT01	SM, POE	08.08.2018	20:35	20:43	22:52	20°C	16°C	1	3/8	None - misty after 1st hour
BACT01	SM, LT ⁹	12.09.2018	06:24	04:30	06:30	13°C	12°C	2	8/8	Light Drizzle
BACT01	SM, POE	12.09.2018	19:18	19:22	21:23	16°C	9°C	1	3/8	None - misty at ground
BACT01	SM, JM ¹⁰	10.10.2018	18:11	18:23	20:24	16°C	13°C	1	3/8	None
BACT02	BM, JH ¹¹	20.04.2018	20:01	20:01	22:00	15°C	13°C	0	0/8	None
BACT02	BM, JH	10.05.2018	20:36	20:36	22:36	10°C	7°C	0	3/8	None
BACT02	BM, JH	14.06.2018	21:19	21:19	23:20	16°C	13°C	0	1/8	None

⁵ Ben Moore

⁶ Stephanie Ford

⁷ Piranesi O'Hare Evans

⁸ Sally McColl

⁹ Lisa Treadwell

¹⁰ Jamie Murphy

¹¹ Joseph Hassall

Transect reference	Surveyor	Date	Sunrise/Sunset	Start	End	Start Temp	End Temp	Wind (BWS)	Cloud cover	Precipitation
BACT02	BM, JH	11.07.2018	21:14	21:15	23:15	15°C	14°C	0	8/8	None
BACT02	BM, JH	10.08.2018	20:33	20:30	22:30	12.5°C	11°C	0	4/8	None - heavy shower prior
BACT02	BM, AH ¹²	13.09.2018	19:15	19:15	21:15	17°C	16°C	0	2/8	None
BACT02	BM, AH	14.09.2018	06:27	04:27	06:28	12°C	12°C	1	8/8	None
BACT02	BM, JM	11.10.2018	18:09	18:09	20:13	18°C	17°C	3	7/8	None
BACT03	SM, CS2 ¹³	13.04.2018	19:49	19:50	21:53	10°C	9°C	1	8/8	None
BACT03	SM, BM	15.05.2018	20:44	20:44	22:47	10°C	8°C	1	8/8	None
BACT03	SM, SF	18.06.2018	21:21	21:22	23:24	21°C	17°C	4	7/8	None
BACT03	SM, POE	19.07.2018	21:07	21:13	23:14	20°C	16°C	1	3/8	None
BACT03	SM, POE	21.08.2018	20:08	20:08	22:09	21°C	18°C	1	5/8	None
BACT03	JA ¹⁴ , LT	25.09.2018	18:47	18:47	20:47	16°C	16°C	1	1/8	None
BACT03	SM, RB ¹⁵	26.09.2018	06:47	04:48	06:49	10°C	8°C	2	4/8	None
BACT03	SM, AH	15.10.2018	18:00	18:07	20:09	14°C	13°C	2	8/8	Light drizzle
BACT04	BM, SF	13.04.2018	19:49	19:49	22:05	10°C	12°C	0	8/8	None
BACT04	BM, SF	22.05.2018	20:54	20:54	22:54	11°C	9°C	3	8/8	None

¹² Aidan Holden

¹³ Carolyn Smith

¹⁴ James Allitt

¹⁵ Rebecca Banks

Transect reference	Surveyor	Date	Sunrise/Sunset	Start	End	Start Temp	End Temp	Wind (BWS)	Cloud cover	Precipitation
BACT04	BM, NT ¹⁶	18.06.2018	21:21	21:20	23:23	19°C	18°C	3	7/8	None
BACT04	BM, JH	18.07.2018	21:08	21:05	23:05	18°C	17°C	0	4/8	None
BACT04	SM, BC ¹⁷	23.08.2018	20:04	20:04	22:04	19°C	19°C	2	8/8	None
BACT04	BM, SM	17.09.2018	19:06	19:06	21:07	20°C	14°C	2	3/8	None
BACT04	BM, JH	18.09.2018	06:34	04:33	06:33	17°C	17°C	2	0/8	None
BACT04	BM, JH	15.10.2018	18:00	18:00	20:00	13°C	12°C	2	8/8	Light drizzle
BACT05	BC, JH	19.04.2018	20:00	20:00	22:00	21°C	17°C	1	2/8	None
BACT05	JA, SF	09.05.2018	20:36	20:35	22:40	15°C	13°C	1	7/8	None
BACT05	SM, POE	27.06.2018	21:22	21:23	23:26	15°C	12°C	2	7/8	None
BACT05	JA, NT	19.07.2018	21:07	21:02	23:02	21°C	20°C	1	1/8	None
BACT05	JA, JH	16.08.2018	20:19	20:23	22:23	16°C	16°C	2	2/8	None
BACT05	JA, AH	26.09.2018	18:44	18:45	20:45	17°C	17°C	1	0/8	None
BACT05	BC, AH	27.09.2018	06:49	04:50	06:55	13°C	10°C	1	1/8	None
BACT05	BC, JM	18.10.2018	17:53	17:53	20:06	13°C	11°C	1	7/8	None
BACT06	BM, MP ¹⁸	16.04.2018	19:54	19:54	21:56	11°C	9°C	0	1/8	None
BACT06	BM, SF	01.05.2018	20:20	20:20	22:21	12°C	9°C	2	1/8	None

¹⁶ Nicky Talbot

¹⁷ Ben Christie

¹⁸ Martin Parker

Transect reference	Surveyor	Date	Sunrise/Sunset	Start	End	Start Temp	End Temp	Wind (BWS)	Cloud cover	Precipitation
BACT06	BM, SF	05.06.2018	21:12	21:13	23:30	11°C	9°C	2	7/8	None
BACT06	BM, SF	03.07.2018	21:20	21:19	21:41	15°C	15°C	2	2/8	None
BACT06	BM, POE	16.08.2018	20:19	20:22	22:24	16°C	16°C	0	0/8	None
BACT06	BM, POE	04.09.2018	19:37	19:37	21:37	15°C	13°C	2	7/8	None
BACT06	BM, AH	02.10.2018	18:30	18:30	20:30	16°C	14°C	2	7/8	None
BACT06	BM, AH	03.10.2018	06:59	04:59	06:59	10°C	8°C	0	0/8	None
BACT07	JA, SF	19.04.2018	20:00	20:00	21:56	19°C	15°C	1	0/8	None
BACT07	JA, JH	03.05.2018	20:24	20:24	22:24	13°C	11°C	1	6/8	None
BACT07	JA, NT	21.06.2018	21:22	21:22	23:26	16°C	13°C	1	4/8	None
BACT07	JA, JH	05.07.2018	21:19	21:16	23:16	17°C	17°C	1	1/8	None
BACT07	BM, JH	02.08.2018	20:46	20:48	22:49	25°C	21°C	0	0/8	None
BACT07	JA, JH	06.09.2018	06:15	04:13	06:13	14°C	14°C	2	4/8	Light rain/low cloud
BACT07	JA, JH	06.09.2018	19:30	19:33	21:33	17°C	13°C	3	8/8	None
BACT07	JA, JM	03.10.2018	18:28	18:27	20:27	16°C	13°C	2	7/8	None

Appendix 4: Details of static detector deployments

Table 12: Deployment details for each static deployment

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA01	BACT01	24.04.2018	02.05.2018	8
BA01	BACT01	21.05.2018	29.05.2018	8
BA01	BACT01	13.06.2018	19.06.2018	6
BA01	BACT01	11.07.2018	17.07.2018	6
BA01	BACT01	08.08.2018	14.08.2018	6
BA01	BACT01	12.09.2018	18.09.2018	6
BA01	BACT01	10.10.2018	17.10.2018	7
BA02	BACT01	24.04.2018	02.05.2018	8
BA02	BACT01	21.05.2018	29.05.2018	8
BA02	BACT01	13.06.2018	19.06.2018	6
BA02	BACT01	11.07.2018	17.07.2018	6
BA02	BACT01	08.08.2018	14.08.2018	6
BA02	BACT01	12.09.2018	18.09.2018	6
BA02	BACT01	10.10.2018	17.10.2018	7
BA03	BACT01	24.04.2018	02.05.2018	8
BA03	BACT01	21.05.2018	29.05.2018	8
BA03	BACT01	13.06.2018	19.06.2018	6

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA03	BACT01	11.07.2018	17.07.2018	6
BA03	BACT01	08.08.2018	14.08.2018	6
BA03	BACT01	12.09.2018	18.09.2018	6
BA03	BACT01	10.10.2018	17.10.2018	7
BA04	BACT02	20.04.2018	26.04.2018	6
BA04	BACT02	10.05.2018	16.05.2018	6
BA04	BACT02	14.06.2018	20.06.2018	6
BA04	BACT02	11.07.2018	17.07.2018	6
BA04	BACT02	10.08.2018	16.08.2018	6
BA04	BACT02	13.09.2018	19.09.2018	6
BA04	BACT02	11.10.2018	17.10.2018	6
BA05	BACT02	20.04.2018	26.04.2018	6
BA05	BACT02	10.05.2018	16.05.2018	6
BA05	BACT02	14.06.2018	20.06.2018	6
BA05	BACT02	11.07.2018	17.07.2018	6
BA05	BACT02	10.08.2018	16.08.2018	6
BA05	BACT02	13.09.2018	19.09.2018	6
BA05	BACT02	11.10.2018	17.10.2018	6
BA06	BACT02	20.04.2018	26.04.2018	6

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA06	BACT02	10.05.2018	16.05.2018	6
BA06	BACT02	14.06.2018	20.06.2018	6
BA06	BACT02	11.07.2018	17.07.2018	6
BA06	BACT02	10.08.2018	16.08.2018	6
BA06	BACT02	13.09.2018	19.09.2018	6
BA06	BACT02	11.10.2018	17.10.2018	6
BA07	BACT03	13.04.2018	19.04.2018	6
BA07	BACT03	15.05.2018	21.05.2018	6
BA07	BACT03	18.06.2018	25.06.2018	7
BA07	BACT03	19.07.2018	25.07.2018	6
BA07	BACT03	21.08.2018	27.08.2018	6
BA07	BACT03	25.09.2018	02.10.2018	7
BA07	BACT03	15.10.2018	22.10.2018	7
BA08	BACT03	13.04.2018	19.04.2018	6
BA08	BACT03	15.05.2018	21.05.2018	6
BA08	BACT03	18.06.2018	25.06.2018	7
BA08	BACT03	19.07.2018	25.07.2018	6
BA08	BACT03	21.08.2018	27.08.2018	6
BA08	BACT03	25.09.2018	02.10.2018	7

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA08	BACT03	15.10.2018	22.10.2018	7
BA09	BACT03	13.04.2018	19.04.2018	6
BA09	BACT03	15.05.2018	21.05.2018	6
BA09	BACT03	18.06.2018	25.06.2018	7
BA09	BACT03	19.07.2018	25.07.2018	6
BA09	BACT03	21.08.2018	27.08.2018	6
BA09	BACT03	25.09.2018	02.10.2018	7
BA09	BACT03	15.10.2018	22.10.2018	7
BA10	BACT04	13.04.2018	19.04.2018	6
BA10	BACT04	22.05.2018	29.05.2018	7
BA10	BACT04	18.06.2018	25.06.2018	7
BA10	BACT04	18.07.2018	25.07.2018	7
BA10	BACT04	27.08.2018	04.09.2018	8
BA10	BACT04	17.09.2018	24.09.2018	7
BA10	BACT04	17.10.2018	24.10.2018	7
BA11	BACT04	13.04.2018	19.04.2018	6
BA11	BACT04	22.05.2018	29.05.2018	7
BA11	BACT04	18.06.2018	25.06.2018	7
BA11	BACT04	18.07.2018	25.07.2018	7

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA11	BACT04	27.08.2018	04.09.2018	8
BA11	BACT04	17.09.2018	24.09.2018	7
BA11	BACT04	15.10.2018	22.10.2018	7
BA12	BACT04	13.04.2018	19.04.2018	6
BA12	BACT04	22.05.2018	29.05.2018	7
BA12	BACT04	18.06.2018	25.06.2018	7
BA12	BACT04	18.07.2018	25.07.2018	7
BA12	BACT04	27.08.2018	04.09.2018	8
BA12	BACT04	17.09.2018	24.09.2018	7
BA12	BACT04	15.10.2018	22.10.2018	7
BA13	BACT05	19.04.2018	26.04.2018	7
BA13	BACT05	09.05.2018	15.05.2018	6
BA13	BACT05	21.06.2018	27.06.2018	6
BA13	BACT05	19.07.2018	30.07.2018	11
BA13	BACT05	16.08.2018	23.08.2018	7
BA13	BACT05	26.09.2018	02.10.2018	6
BA13	BACT05	18.10.2018	24.10.2018	6
BA14	BACT05	19.04.2018	26.04.2018	7
BA14	BACT05	09.05.2018	15.05.2018	6

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA14	BACT05	21.06.2018	27.06.2018	6
BA14	BACT05	19.07.2018	30.07.2018	11
BA14	BACT05	16.08.2018	23.08.2018	7
BA14	BACT05	26.09.2018	02.10.2018	6
BA14	BACT05	18.10.2018	24.10.2018	6
BA15	BACT05	19.04.2018	26.04.2018	7
BA15	BACT05	09.05.2018	15.05.2018	6
BA15	BACT05	21.06.2018	27.06.2018	6
BA15	BACT05	19.07.2018	30.07.2018	11
BA15	BACT05	16.08.2018	23.08.2018	7
BA15	BACT05	26.09.2018	02.10.2018	6
BA15	BACT05	18.10.2018	24.10.2018	6
BA16	BACT06	16.04.2018	23.04.2018	7
BA16	BACT06	01.05.2018	06.05.2018	5
BA16	BACT06	05.06.2018	11.06.2018	6
BA16	BACT06	03.07.2018	10.07.2018	7
BA16	BACT06	16.08.2018	22.08.2018	6
BA16	BACT06	04.09.2018	18.09.2018	14
BA16	BACT06	02.10.2018	09.10.2018	7

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA17	BACT06	16.04.2018	23.04.2018	7
BA17	BACT06	01.05.2018	08.05.2018	7
BA17	BACT06	06.06.2018	10.06.2018	5
BA17	BACT06	-	-	0
BA17	BACT06	16.08.2018	22.08.2018	6
BA17	BACT06	04.09.2018	18.09.2018	14
BA17	BACT06	03.10.2018	08.10.2018	5
BA18	BACT06	16.04.2018	23.04.2018	7
BA18	BACT06	01.05.2018	06.05.2018	5
BA18	BACT06	05.06.2018	11.06.2018	6
BA18	BACT06	03.07.2018	10.07.2018	7
BA18	BACT06	16.08.2018	22.08.2018	6
BA18	BACT06	04.09.2018	18.09.2018	14
BA18	BACT06	02.10.2018	09.10.2018	7
BA19	BACT07	19.04.2018	26.04.2018	7
BA19	BACT07	03.05.2018	10.05.2018	7
BA19	BACT07	21.06.2018	29.06.2018	8
BA19	BACT07	05.07.2018	10.07.2018	5
BA19	BACT07	02.08.2018	08.08.2018	6

Static point	Transect reference	Deployment start date	Deployment end date	No. nights deployed
BA19	BACT07	06.09.2018	19.09.2018	13
BA19	BACT07	03.10.2018	17.10.2018	14
BA20	BACT07	19.04.2018	26.04.2018	7
BA20	BACT07	03.05.2018	10.05.2018	7
BA20	BACT07	21.06.2018	29.06.2018	8
BA20	BACT07	05.07.2018	10.07.2018	5
BA20	BACT07	02.08.2018	08.08.2018	6
BA20	BACT07	06.09.2018	19.09.2018	13
BA20	BACT07	03.10.2018	17.10.2018	14
BA21	BACT07	19.04.2018	26.04.2018	7
BA21	BACT07	03.05.2018	10.05.2018	7
BA21	BACT07	21.06.2018	29.06.2018	8
BA21	BACT07	05.07.2018	10.07.2018	5
BA21	BACT07	02.08.2018	08.08.2018	6
BA21	BACT07	06.09.2018	19.09.2018	13
BA21	BACT07	03.10.2018	17.10.2018	14