ECOLOGICAL MANAGEMENT PLAN

FAZAKERLEY WWTW

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1 INTRODUCTION

Arcus Consultancy Services Limited (Arcus) was commissioned by United Utilities to prepare an Ecological Management Plan (EMP) to discharge Planning Condition 22 ('the Condition') of the consent for an onshore wind turbine measuring 78 metres (m) in height to blade tip (Application No. 14F / 1296). Liverpool City Council ('the Council') granted planning permission for the Development on 9th December 2014 subject to a condition requiring a scheme for bat habitat mitigation and enhancement be submitted to the Council prior to the First Export Date. The Condition states:

> "*Prior to the First Export Date, a scheme for the monitoring of bat and swift activity during operation of the wind turbine shall be submitted to and agreed in writing with the Local Planning Authority. The scheme shall be in general accordance with the note titled Post-Construction Monitoring Principles for Bats and Swifts (ref: UA004526-33-EEC-01) received by the Local Planning Authority on 2nd September 2014. Bat and swift activity monitoring shall be carried out in accordance with the agreed scheme.*
>
> *REASON: In the interests of biodiversity*"

This EMP sets out the details of the measures that will be implemented to meet the requirements of the Condition.

The scope of work has been prepared in general accordance with the report entitled *Post-Construction Monitoring Principles for Bats and Swifts (ref: UA004526-33-EEC-01)*. Deviations from this report have been recommended where considered beneficial to stakeholders or to reflect changes in emerging best practice since the production of the report.

Where appropriate, survey methods will follow those of the baseline bat and bird surveys, fully documented in *United Utilities Wind Turbine Bat Survey Report (May 2014)*. Full details are therefore not repeated herein, except to detail alterations to the original method or additional methods or surveys not undertaken as part of the baseline.

2 THE DEVELOPMENT

The Development is located within Fazakerley Wastewater Treatment Works (WwTW) ('the site') in the northeast of Liverpool. To the north and south of the site lie residential areas. To the east is a retail park and to the west there is woodland and ponds between the site and Lower Lane and to the west of Lower Lane there are recreational grounds and open space. The Development consists of the following elements:

- A single wind turbine 78 m in height to blade tip;
- Wind turbine foundations;
- An electricity substation with a gross floor area of no more than 40 m^2; and
- A construction compound no larger than 1,000 m^2.

The Development will be located to the east of linear filtration beds and to the south of circular treatment lagoons. To the east of the Development there is an open area of scrub and grassland and to the south is an area of woodland and grassland with settlement lagoons.

3 BATS

3.1 Surveys

3.1.1 Transect

Transect surveys will be undertaken at approximately monthly intervals between April and October, as outlined in Section 6 of this EMP. Each survey would consist of a single walked transect commencing approximately 30 minutes before sunset and lasting approximately 2.5 hours. A series of sample points would be distributed along the transect. The transect route and sample point locations would be the same as those of the baseline surveys, as far as is practicable, although they may be amended to suit the needs of the ongoing monitoring. All bat calls would be recorded using suitable bat call recording equipment.

3.1.2 Remote Monitoring

Two remote bat detectors will be deployed for a minimum of five consecutive nights once per month April–October. The monitoring locations, as far as is practicable, will the same as those used during the baseline data collation.

3.1.3 Mortality Surveys

To improve the efficacy of the mortality surveys, the habitat in the close vicinity of the turbine should be managed in line with the recommendations in the LMP.

3.1.3.1 Carcass searches

Carcass searches will be carried out once per month April–October, equating to seven searches per annum. The aim of carcass searching will be to locate carcasses in a predetermined area beneath the turbine over a fixed period of time.

The area beneath and immediately surrounding the turbine base will be surveyed using a transect set up on a grid system with approximate dimensions of 50 m x 50 m centred on the turbine base. A minimum of 2.5 m either side of the transect will be searched for carcasses. Surveys will begin between sunrise and 60 minutes after sunrise to allow ambient light to reach a level that does not inhibit visual searches. During each carcass search, a number of weather variables will be recorded including wind speed, wind direction, rain, cloud cover and any impediments to sight e.g. low sunlight, heat-haze etc.

Carcasses will be photographed in situ and details of the carcass, where possible, will be recorded, including: species, age and sex, GPS location, distance from turbine, state of decomposition, signs of scavenging, and any indication of cause of death or freshness of carcass. Bat carcasses, or tissue samples, will be sent for genetic analysis to ensure accurate identification to species.

3.1.3.2 Surveyor efficiency trials

The number of carcasses recorded depends on the ability of the surveyor to observe each carcass, and this ability will vary between surveyors and habitat types. Therefore, it is important to establish surveyor efficiency to more accurately understand the proportion of carcasses likely to be observed.

Surveyor efficiency trials will be undertaken once per month April–October during or immediately following a carcass search. Only the surveyors who completed the carcass search will undertake the surveyor efficiency trial on each occasion. Surveyors will alternate between surveys so as to minimise potential bias. Surrogate bat carcasses will be deployed within the search area for the purpose of the survey.

One surveyor will deploy the carcasses within the search area ensuring that the surveyor to be tested cannot see where they were deployed. The second surveyor will then search for the carcasses using the same search method as carcass searching. The total number of carcasses observed will be recorded.

The aim of the surveyor efficiency trials is to produce a statically robust estimate of the efficiency of each surveyor. The number of carcasses deployed will need to reflect the habitat composition of the search area whilst also being sufficient to inform the analytical stages of the monitoring programme. The number of carcasses deployed will therefore remain flexible to enable the scope of the survey to be tailored to reflect the results of the ongoing surveys and statistical analysis. A minimum of 10 carcasses will deployed for each trial during the first year of monitoring. This number may be revised in light of ongoing surveys and analysis.

3.1.3.3 Carcass persistence trials

The aim of the carcass persistence trials is to determine how long a carcass will persist in the study area. The length of time before a carcass is removed or destroyed by scavengers will have a direct influence on the likelihood of carcasses being recorded.

Carcass persistence trials will be undertaken once per month April–October. Surrogate bat carcasses (e.g. mice) will be deployed and inconspicuously marked. The degree to which a carcass is hidden from view (i.e. habitat type) will be categorised, for example, as Exposed, Partially Hidden or Hidden. The actual categories used will need to reflect the conditions on site and the analysis methods to be employed and will be determined at the discretion of the appointed ecologist.

Carcass persistence trials should be undertaken outside the carcass search area because placing carcasses within the search area may attract scavengers thus biasing the results of the carcass searches by increasing the rate of carcass removal. Furthermore, scavenging birds may be attracted into the vicinity of the turbine and thus exposed to an increased risk of collision with the turbine. Carcass locations will be marked using a GPS and recorded on large-scale mapping. Each location will be searched for presence or absence following each of the carcass searches. Carcasses will also be monitored using camera traps during the survey period to provide more detail about carcass persistence rates.

A minimum of five carcasses will be deployed for each trial during the first year of monitoring. However, the number of carcasses deployed will need to reflect the habitat composition of the search area whilst also being sufficient to inform analysis. The number of carcasses deployed will therefore remain flexible to enable the scope of the survey to be tailored to reflect the results of the ongoing surveys and statistical analysis.

3.2 Analysis

3.2.1 Transect and Remote Monitoring Surveys

Data generated during transect and remote monitoring surveys will be analysed in line with the methods of the baseline technical reports. Efforts should be made to make comparisons between the baseline and post-construction monitoring data. Standard indices of activity – bat passes per night and per hour – should be calculated in order to facilitate the comparison of data between each year of post-construction monitoring.

Further analyses should be undertaken, as appropriate, to better contextualise bat activity, including, for example, analyses of weather variables and detailed analysis of temporal patterns of activity. Statistical analyses should also be considered in order to reduce the subjectivity of conclusions.

3.2.2 Mortality Surveys

Data generated during the carcass searches, surveyor efficiency trials and carcass persistence trials will be used to calculate estimates of bat mortality as a result of direct impacts with the turbine. The data generated from the carcass searches, surveyor efficiency trials and carcass persistence trials will be analysed purpose-designed software, the choice of which will reflect the data.

3.3 Reporting

An annual report will be provided to the Council following the completion of each year of monitoring. The report will detail the methods and findings from each year of survey. The report will provide details on the efficacy of the monitoring programme and will include recommendation for amendments to the EMP where required.

4 SWIFTS

4.1 Surveys

4.1.1 Vantage Point Surveys

Vantage point surveys comprising six hours of observation will be carried out during each survey month May–August. A single vantage point would be selected that provides good visual coverage of the wind turbine location. Each six hour survey would be split into two three-hour surveys, with a break of at least 30 minutes between them, to prevent observer fatigue. Swift abundance and observed activity and average flying height (e.g. below, at and above rotor-swept height) would be recorded during each survey, with a summary of the observed activity provided after each three-hour period of observation, including mapping areas of peak flight activity.

4.1.2 Walked Transects

A transect survey consisting of a single walked transect will be undertaken once per month May–August. The transect route will follow, as closely as is practical, the transect route used in the baseline survey to record evidence of breeding behaviour. The data gathered during this survey will allow a comparison to be made with the baseline data.

4.1.3 Mortality Surveys

4.1.3.1 Carcass Searches

Searches for swift carcasses would be undertaken simultaneously with the bat carcass searches as per the method in Section 3.1.3.

4.1.3.2 Surveyor efficiency trials

Between May and August inclusive, surveyor efficiency trials would be undertaken as per the method for bats (Section 3.1.3). Surveyor efficiency may vary for swift and bat carcass searches. Therefore, surrogate swift carcasses (which will differ from bats surrogates) will be deployed within the search area.

4.1.3.3 Carcass persistence trials

Between May and August inclusive, carcass persistence trials would be undertaken as per the method for bats (Section 3.1.3). Carcass persistence may vary for swift and bat carcasses. Therefore, surrogate swift carcasses (which will differ from bats surrogates) will be deployed within the search area.

4.2 Analysis

Territory mapping will be carried out to show distribution of breeding birds (following British Trust for Ornithology (BTO) territory mapping guidance used in e.g. BTO Breeding Bird Survey/RSPB Swift Survey), and regular flight paths will be shown and locations of any carcasses will be mapped.

4.3 Reporting

An annual report will be provided to the Council following the completion of each year of monitoring. The report will detail the methods and findings from each year of survey. The report will provide details on the efficacy of the monitoring programme and will include recommendation for amendments to the EMP where required.

5 VARIATION TO MITIGATION

The note titled Post-Construction Monitoring Principles for Bats and Swifts referred to in Condition 22 states:

Section 1

> "*Post-construction monitoring has been proposed as part of the Environmental Assessment Report dated 20 May 2014 (ref 020-UA004526-UE31-A) to demonstrate the success (or otherwise) of any proposed ecological mitigation measures and to increase the knowledge-base with regards the effects of wind turbines on bats and birds. It is intended that this monitoring be used as a means of mitigation where any uncertainty exists in the assessment of potential impacts on bats and swifts, which can result from a lack of published literature and evidence on this topic.*"

Section 2.3

> "*In the event that the post-construction monitoring identifies a change in bat activity levels that could constitute a significant adverse effect on the local bat population, additional mitigation measures would be discussed and agreed in writing with the Local Planning Authority to avoid, reduce and/or offset the effect to an acceptable level.*"

Section 3.3

> "*In the event that the post-construction monitoring identifies a change in activity levels of swifts that could constitute a significant adverse effect on the regional population, additional mitigation measures would be discussed and agreed in writing with the Local Planning Authority to avoid, reduce and/or offset the effect to an acceptable level.*"

If during the course of the post-construction monitoring robust conclusions can be drawn about the effects of the Development on bats or swifts then prescribed mitigation may be revised. The scope of such revisions will be evidence-based and agreed in consultation with the Council and other stakeholders. However, to a large extent mitigation measures will be defined by the information submitted to address Conditions 21 (LMP) and 23 (Bat Protection Scheme).

6 PROGRAMME

Post-construction monitoring will be undertaken in years 1, 2, 3, 5 and 10 of the operational phase of the Development.

After the completion of monitoring in years 1–3 the requirement for the continuation of the programme of monitoring in years 5 and 10 will be assessed in consultation with the Council.