Background and Methods
Arcus Consultancy Services Ltd was contracted to provide Ecological Clerk of Works (ECoW) at Arna Wood Solar Farm (the ‘Site’) as defined in the Ecological Construction Method Statement (ECMS) and Construction Method Statement (CMS) submitted with the planning application for the development.

Due to the Site’s proximity to designated sites of ornithological interest (notably Morecombe Bay Special Protection Area (SPA) and Ramsar site), the CMS provided special measures to minimise disturbance to birds associated with the designations during the winter period (November–March). In accordance with the CMS, an ornithologist attended the Site during the initial phase of construction to monitor the effects of construction activities on birds.

Over 27 hours of observations were made at the Site and surrounding area at beginning of the construction period, between 18th and 26th January 2017. Observations were stratified to cover various times of day and periods throughout the tidal cycle.

Observations were made using a combination of methods including the ‘look-see’ method (Bibby et al. 2000)¹ to identify and count species present, as used in the British Trust for Ornithology’s Wetland Bird Survey (WeBs), and a series of short Vantage Point (VP) watches to record disturbance events and likely causes. Observations focussed on the area of the Lune estuary immediately adjacent to the Site with further coverage of the wider area up to 2 km in either direction along the estuary and inland fields.

Observations – abundance and distribution of birds
Eleven species associated with the SPA and Ramsar designations were observed: cormorant, pink-footed goose, shelduck, wigeon, goldeneye, oystercatcher, lapwing, golden plover, curlew, redshank, and dunlin. A summary of sightings of these species is provided in Table 1.

No bird species associated with the designations were recorded directly within the Site or immediately adjacent fields at any time. To the west, within the intertidal and saltmarsh habitats of the River Lune estuary, most birds followed a regular and predictable pattern of behaviour and distribution. Waders (e.g. lapwing, curlew, and redshank) were present feeding and/or roosting in the intertidal areas of the River Lune when mud was exposed over the low tide period and moved to the saltmarsh as the tide rose. Wildfowl (e.g. wigeon, goldeneye) were generally more numerous over the high-tide period and present exclusively on the River Lune or its shoreline. Mixed-species flocks numbering in excess of 3000 birds were observed in this wider area although, overall, relatively few birds were observed within 500 m of the Site.

Table 1: Sightings of species associated with the SPA and Ramsar designations

<table>
<thead>
<tr>
<th>Species</th>
<th>Sightings within 500 m of Site</th>
<th>Comments and details</th>
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</thead>
<tbody>
<tr>
<td>Cormorant</td>
<td>Occasional birds transiting through the area</td>
<td>Small numbers were observed transiting through the wider area and several individuals were noted feeding on the River Lune over the high tide period.</td>
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<tr>
<td>Pink-footed Goose</td>
<td>Two birds flew directly over the Site</td>
<td>Flocks numbering up to 2500 birds were observed in fields to the west of the River Lune (In excess of 1.7 km south-west the Site). Flocks numbering between 30 and 200 individuals were occasionally observed transiting through the wider area, mostly in</td>
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Shelduck | Scattered individuals observed on the river and adjacent saltmarsh | Scattered individuals were present throughout the wider area not totalling more than 50 individuals. No concentrations were observed.

Wigeon | Small flocks numbering 5–30 birds on the River Lune and shoreline | Up to approx. 300 birds were observed in the wider area, mostly on the River Lune and shoreline over the high-tide period. Birds moved widely throughout the area.

Goldeneye | Small numbers on the River Lune | Up to 10 birds recorded feeding on the River Lune, mostly over the high-tide period.

Oystercatcher | Scattered individuals observed on the river and adjacent saltmarsh | During low tide, birds were scattered over a wide area. At high tide, concentrations of oystercatcher roosted well to the north of the Site.

Lapwing | Up to 200 birds were observed on the saltmarsh immediately adjacent to the Site | In the wider area, flocks numbering up to 2500 lapwing were present on the intertidal areas and saltmarsh to the north of the Site.

Golden plover | Seen only in flight, transiting through the area | Up to 500 were present in the wider area, forming mixed flocks with the lapwing present on intertidal areas and saltmarsh to the north of the Site.

Curlew | Small numbers on the river, adjacent saltmarsh, and in flight over the Site. A flock of 32 were observed in a field c.300 m north of the Site | Up to 180 were observed in the wider area, most frequently roosting and feeding on the saltmarsh north of the Site. Some birds were observed flying east; perhaps transiting to feeding areas within fields further inland.

Redshank | Scattered individuals observed on the river and adjacent saltmarsh | In excess of 200 individuals were estimated to be using the wider area, mostly distributed along the river and saltmarsh habitats to the north of the Site.

Dunlin | None | Up to 50 birds were observed to the north of the Site, associating with lapwing and golden plover flocks.

**Observations – Disturbance**

A number of disturbance events were witnessed varying from small scale (<10 individuals) to mass movements of several thousand birds.

Small disturbances were typically caused by members of the public using the footpath or walking on the saltmarsh. Larger disturbance events frequently occurred in areas outside the 500 m buffer of the Site and were caused by birds of prey (peregrine or buzzard) or were spontaneous or of unknown cause.

Noise from construction activities associated with the Site was audible 750 m to the north of the Site but no bird disturbance was attributable to the construction activities.

Given the large expenses of suitable and higher value habitats (i.e. mudflats and saltmarsh) in the immediate vicinity, most movements of birds were relatively short and the birds resumed natural behaviour quickly after relocating.

**Recommendations**

Based on the observations, the risk of substantive disturbance, from construction activities, to species associated with the SPA and Ramsar designations is considered negligible. However, due to the changing nature and location of the work to be undertaken within the Site, the situation should be reviewed at regular intervals. The following recommendations are made to minimise any potential disturbance that could occur, particularly if the numbers and/or distributions of birds in nearby areas change during the construction period:
- The grassland habitats within the Site are suitable for species associated with the SPA and Ramsar designations. If flocks of birds (e.g. pink-footed goose, golden plover, oystercatcher, or curlew) are observed within the Site or adjacent fields, it is recommended that works using heavy machinery are stopped until the birds move away from the area naturally.
- The ECoW (on site weekly during all works) continues to monitor the situation, making observations and counts of birds within the area surrounding the Site and recording disturbance events and likely causes.
- If disturbance to birds is observed at a later date, new measures may be proposed by the ECoW. These could include changing the timing and location of construction activities to avoid sensitive times (e.g. high tide) and locations (e.g. nearer the SPA).
- If the construction period extends beyond 15th March 2017, the pre-clearance checks will need to be performed by the ECoW in any areas where vegetation is to be cleared or where work is to be carried out in close proximity to hedges to avoid destruction or disturbance to active nests of breeding birds.